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Season's Greetings

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AUTOMOTIVE INDUSTRIES

Vol. 67, No. 26 • THIRTY-FOURTH YEAR • December 24, 1932

Car Makers Mobilize—

Increased power and improved body lines; Simplified starting and power brakes; Greater flexibility in engine mountings; Chassis frames of increased rigidity; Universal joints with needle bearings; Greater use of downdraft carbureters; Automatic heat control by thermostat; Inertia-controlled shock absorbers;

—for 1933 Drive

by P. M. Heldt

ENGINEERING departments in 1932 seem to have divided their efforts about equally between improvement in body lines and development of mechanical features that render the car easier and simpler to operate and more comfortable to ride in.

As to general trends, power is still being increased all along the line, and a good many manufacturers also have increased the size of their cars. The output of the six-cylinder Hupmobile engine, for example, has been raised from 75 to 90 hp., and both the bores and the peaking speeds of the two eight-cylinder engines have been increased. A good example of increase in size is furnished by Buick, which has lengthened the wheelbases of all its four models; there are numerous examples of increases in tread to several inches beyond the standard width.

Except at the lower end of the price scale, there has been little change with respect to cylinder numbers. Plymouth has given up the four-cylinder engine in favor of the six, and Ford also is said to be abandoning the four, though there has been no official announcement to that effect. On the other hand, two new four-cylinder, low-priced cars have made their appearance, the Willys and the Continental.

In the following review of the more important chassis improvements, it may be well to point out here, a statement to the effect that a feature has been adopted by a certain manufacturer does not imply that it is found in all the different lines of that manufacturer.

Automotive Industries this week represents the combined issues of Dec. 24 and Dec. 31, due to the unusual fact that there are 53 publication dates (Saturdays) in 1932, instead of the usual 52.

The next regular issue will appear on Jan. 7, 1933, as No. 1, Volume 68 of Automotive Industries.

Engines in General

Compression ratios are increased

Exhaust valve-seat inserts, which so far as cast-iron cylinder blocks are concerned were first used in truck and bus engines, have made their appearance in the passenger-car field, and most of the engines of the different Chrysler Corporation lines have them. The distinction between passenger-car engines as light-duty, and truck and bus engines as heavy-duty, is losing its significance, for with our modern highways, which permit of sustained speeds for long periods, the service of the passenger-car engine may be as severe as that of the commercial-vehicle type. Even the engine of the Willys small four has such exhaust valve seat inserts, the material in this case being high-speed tool steel. On the other hand, the twelve-cylinder Pierce Arrow engine now has its cylinder blocks cast of electric furnace chromium iron, which, as is well known, is harder than the ordinary gray iron and therefore gives better cylinder wear, and no doubt also stands the pounding of the valves better.

Compression ratios have been generally increased, and several manufacturers again offer an optional high-compression head designed for the use of special anti-knock fuels. As examples of modern practice with regard to standard compression ratios the following may be mentioned: Dodge, Plymouth, Rockne and Studebaker, 5.5; Hupmobile Six, 5.75; Terraplane Eight, 5.8; Hudson Six with Bohnalite aluminum composite head, 6.2.

Pistons have not been changed much on the whole, but an increasing number of them carry four piston rings instead of three, and in many cases two of these are oil-control rings. With the high engine speeds now current, high oil consumption has become quite a problem, and the chief object of the change in ring practice is to overcome this trouble. There seems to be something of a tendency toward that type of aluminum-alloy piston in which the skirt has a T slot, the vertical branch of the slot ending some distance from the open end of the piston. The horizontal branch partly separates the skirt from the ring belt and thus dams the heat flow to the skirt. The slot is located on the side of the piston opposite that which takes the thrust during the power stroke. Pistons of the Terraplane engine are made of a silicon alloy of aluminum.

An increased number of engines have floating piston pins. While this is an old practice, it has gained in popularity with increase in engine speeds. There is no doubt that it gives much greater protecton against seizing of the pin.

In the efforts to lighten reciprocating parts to make higher speeds possible, the safety factor of connecting rods in some instances seems to have been cut to the limit. This applies particularly to the "big end," which it is difficult to make light and at the same time sufficiently rigid. For quite a number of years back it has been the usual practice to cast babbitt into the big ends centrifugally. When this was first adopted it did away with bronze bushings, thereby saving considerable weight, and at the same time it assured a much better path for heat flow from the bearing surface to the outside of the head, as the heat did not have to flow through a machined joint. Lately, however, better results have been obtained with fitted bushings consisting of steel backing with a babbitt lining, both very thin. The thinness of the bushing seems to enable it to mold itself to any irregularities in the machined surface of the rod, thus assuring high heat conductivity, and from the service angle the new practice has the advantage that the bushing can be replaced without removing the rod from the engine, while when babbitt is spun into the rod itself the whole rod must be replaced.

Packard has a new design of connecting rod in which the cap is provided with fins for additional stiffness and increased radiating capacity, and in which what are usually the weakest points of a connecting rod heads, at the seats for the bolt heads, are stiffened by extending the flanges of the shank past the seats. In the new Pontiac eight-cylinder engine the connecting rod shanks are of cruciform section and are provided with lugs near the big end from which metal can be removed for equalizing the weights of all rods and for shifting the center of gravity of individual rods.

Valves and Valve Gears

Tappets of larger diameter are used

In connection with valves, some study has been given to the problem of preventing oil from being drawn through the valve guides into the combustion chamber during the suction stroke—another factor contributing toward excessive oil consumption. In one engine the valve guide is chamfered internally at the bottom, and the valve stem is relieved where it enters the guide. In engines of low-priced cars the use of valve-tappet clusters has been largely abandoned, and the tappets bear directly in machined holes in the block. In such cases, however, it is customary to use tappets of quite large diameter, and with the copious lubrication assured by the oil mist in both the crankcase and the valve chamber, the need for refitting probably does not arise during the life of the engine. In the new Plymouth engine the steel tappets have heads of chilled cast iron welded to them.

The use of hydraulic automatic valve-tappet adjusters, which so far has been confined to V engines in which the valves are actuated through rocker levers and the take-up is effected by means of an eccentric bushing (Cadillac, Packard), has now been extended to vertical L-head engines, Pierce Arrow having worked out such a take-up for its eight-in-line engines.

Where mushroom-type cam followers are used, it has long been considered desirable to have the valve tappets rotate in their guides while the engine is running, as that changes the contact surface from cycle to cycle, and therefore distributes and reduces the wear. In the past this rotation of the tappets has been brought about sometimes by offsetting the cam axially with relation to the tappet axis, but in some of the latest engines of General Motors Divisions the cam surfaces are tapered, so that the bearing point on the tappet foot is off center.

Ever since the appearance of the Ford V-8 there has been talk of the use of cast iron crankshafts. While such crankshafts are still a possibility of the future, the cast-iron camshaft made its appearance on the Essex Terraplane. It is made of electric-furnace iron. Both the cams and the journals are cast in chills, and sufficiently close to size so that only grinding is required to finish them. These chilled sur-

faces are said to offer greater resistance to wear than the case-hardened surfaces of the usual steel camshaft. Cast iron camshafts naturally are a good deal cheaper to produce than the ordinary case-hardened steel camshafts, since no dies are required, and the expenses for forging, machining, plating and case-hardening are eliminated. A tensile strength of 50,000 to 70,000 lb. per sq. in. is claimed for the material in these camshafts, and there is no doubt that they can be given ample strength to withstand both the torsional and bending loads. In fact, the only disadvantage of cast iron for this purpose would seem to be that it has a modulus of elasticity only about half as great as that of steel, so that under the same transverse load it will flex twice as much as steel. It would therefore seem desirable to provide such camshafts with a considerable number of bearings, so that none of the cams is far from a support.

In connection with camshaft drives there has been a reversion to gear drive in a number of instances. In the new Willys Four a metal-gear drive is used. The Hudson Six also has a geared camshaft drive, and all of the models of the Studebaker Corporation this year have camshaft drive by non-metallic gear and metal pinion. The chief reason for the abandonment of gear camshaft drive when high-speed multi-cylinder engines came in, was that as a result of torsional vibration of these shafts, the gears were noisy and often failed in service; now the use of torsional vibration dampers is practically universal, and the conditions affecting the drive are therefore not so severe. Most of the new engine designs seem to use a damper in which the elastic energy of the crankshaft is dissipated in a rubber member.

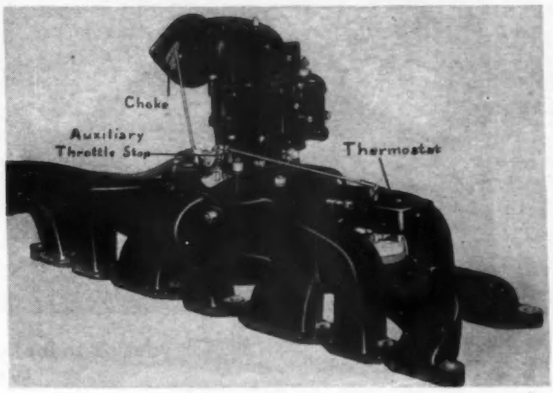
The output of Packard engines is said to have been increased by increasing the overlap of the inlet and exhaust periods to 20 deg. The need for such a large overlap is no doubt due chiefly to the very gradual ramps now employed on cams—for silence—so that although inlet and exhaust valves are open simultaneously, neither of them is far off its seat at any time during this period of overlap.

Fuel Systems

Powerplant improvement trend to downdraft carburetors

Most of the powerplant improvements this year have to do with the fuel system. In the first place, there has been something of landslide toward downdraft carburetion. Probably more than half of the models on the market have the carburetors above the engines. It may be briefly recalled that the reason behind this arrangement is that it is not necessary to use an inlet tract of small cross section to assure getting fuel into the cylinders at low speeds, since the fuel particles do not have to be lifted by the air stream, and an inlet passage of larger section adds to the maximum power which it is possible to obtain from the engine.

Like every other innovation, the downdraft principle as first applied was not without some disadvantages. With an updraft carburetor, if the engine is choked excessively, the excess fuel drains to the ground, but with a downdraft carburetor it accumulates in the manifold and the valve pockets, "loading" the engine. Such accumulations of fuel naturally will consist mainly of the "heavier ends" of the gasoline. Owing to these accumulations, distribution is likely to be quite non-uniform when the car is on a grade, as there is then a tendency for the liquid fuel to flow to the rear cylinders. Another result of the "loading" is that when a car is brought to a stop, the flow of heat from the cylinders to the pools of fuel causes the latter to evaporate and the engine to smoke.



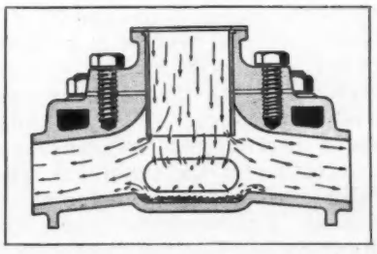
Automatic choke control on a twelve-cylinder car. The thermostat controls both the auxiliary throttle stop and the choke valve

Needless to say, these shortcomings of the early downdraft installations have had the attention of carburetor experts. "Loading" of the manifold and valve pockets results primarily from excessive choking, and this should be prevented by the automatic, thermostatically-controlled chokes with which many of the new cars are equipped. This new type, temperature-controlled automatic choke which eliminates hand-choking entirely, was pioneered on the Oldsmobile last year but is being used on the cars of a considerable number of different makers for the first time this year. It is a Stromberg development. A thermostat of the well-known bimetalic strip type and a vacuum cylinder are used to control the choke valve.

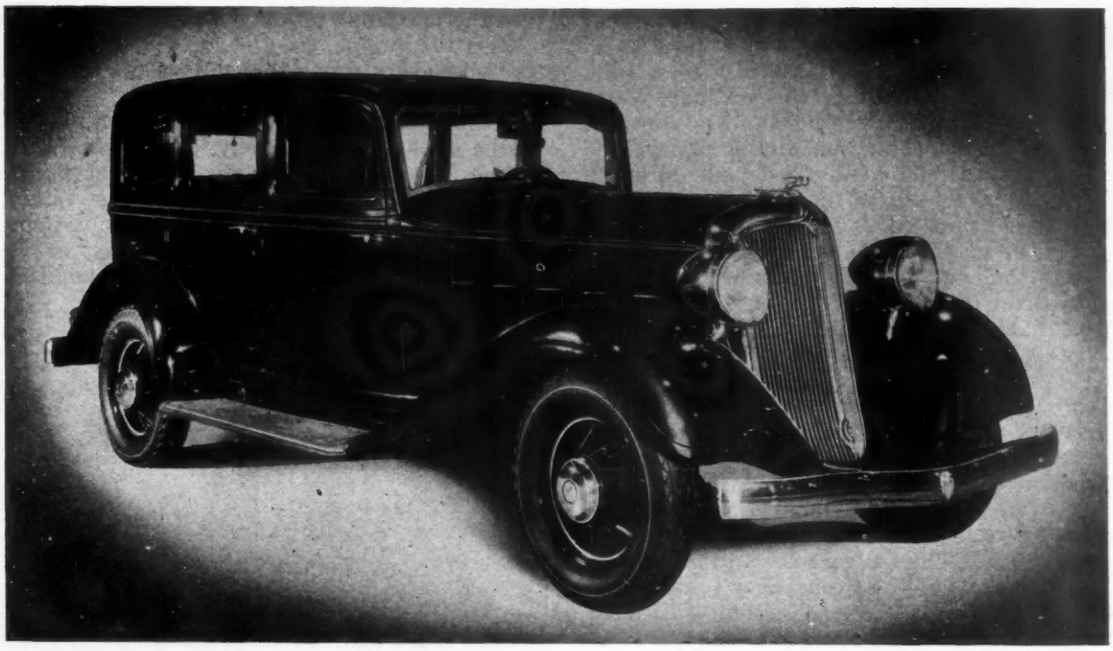
Efforts to prevent loading of the manifold and unequal distribution of the fuel with a downdraft carburetor are evident in the layout of the Chevrolet inlet manifold, a sectional view of the center section of which is shown herewith. There is at this point a shallow well, in which any unvaporized fuel may collect before it passes on to the inlet ports. Since the bottom of this well is exhaust-heated, the fuel has a good chance to be vaporized before it passes on. On this same car, to prevent an excess of unvaporized fuel from running toward the rear-cylinders on upgrades, the branches of the manifold are made to slope down toward the ports.

"Heat control" for the inlet manifold has been a feature of certain cars for a good many years, but in

(Turn to page 811, please)



Center section of inlet manifold on Chevrolet, showing exhaust heated well in which liquid fuel is vaporized



Chrysler six sedan, showing characteristic Chrysler 1933 body lines.

Longer Wheelbase and Greater

THREE of the four lines of cars which are to be offered during 1933 by the Chrysler Sales Corp., were given their first public showing in Detroit, Friday and Saturday, Dec. 9th and 10th. The line consists of the Chrysler six, on a 117 in. wheelbase at list prices from $795 to $1095, the 120 in. wheelbase Royal eight at from $935 up, with the four-door sedan at $995, the Chrysler Imperial on a 126 in. wheelbase chassis at $1395 for the four-door sedan, and the Custom Imperial on a 146 in. wheelbase, with custom bodies only. The latter car was not shown.

At these prices, the Chrysler six models list at some $50 to $70 less than last year, the new Royal eight prices are only $60 to $100 higher than the 1932 six, and the Imperial Sedan lists at $100 less than last year's Chrysler eight.

Characteristic of all lines are sloping radiator fronts, with fenders carried down in front to conceal the chassis, adoption on all models except the Imperial eight of hoods extending back over the cowl for increased length appearance, beavertail backs, shatterproof glass in all windshields (all around on the Custom Imperial) and louvre doors increasing in size toward the rear.

Interiors have been dressed up materially with new instrument panels, having translucent face dials of large diameter, ash trays in all front compartments either in the dash or on top of the ledge behind the V-shaped windshields, cigar lighters in front compartments and ash trays built into the garnish moldings in the rear compartments of the six and Royal, and into the arm-rests of the Imperial.

Body lines on the six and Royal eight are similar, with some deviations on the Imperial. Some of the cars were shown with lacquered and some with chrome-plated radiator shells. Ivory finish control knobs and buttons evidently are standard on all lines. One model of the six, a convertible sedan was shown with 7.00/15 in. air-wheel low-pressure balloon tires. All cars carry metal tire covers as standard equipment at extra cost, finished to match the bodies. Dual wipers, two interior sun-visors, rear quarter curtains are standard on the Imperial models which have exceptionally well finished de-luxe interiors, comparable with last year's Imperial at much higher prices.

On this car also, power boosters (B-K) for the brakes are standard equipment. Cylinder heads are of the high compression type on both Imperials, and available at extra cost on the six and Royal eight. With these heads of 6.2 to one ratio the Chrysler six develops 89, and the Royal eight 98 hp.

Outstanding mechanical improvements to be found on the entire new line include the following:

Three speed transmissions, silent in all gears by virtue of use of helical gears throughout. Shift between low and reverse is by sliding helical gear on helical mainshaft splines, similar in design to, but larger than the transmission on the Dodge 6, previously announced. On the Custom Imperial four speed internal gear transmissions are retained.

Adoption of the pendulum type inertia cushioning valve in connection with the automatic vacuum clutch control. Free-wheeling is also standard on all models, disconnecting the transmission both fore and aft when

The New Chryslers at a Glance

Chassis Model	Base Price	Wheel-base	Horse-power	Standard head, ratio	Bore and Stroke
1933 Six	$795	117	83@3600	5.35 to one	3¼ x 4½
1932 Six	865	116⅜	82@3400	5.35 to one	3¼ x 4½
1933 Royal 8	935	120	90@3400	5.2 to one	3¼ x 4⅛
1932 Chrysler 8	1435	125	100@3400	5.2 to one	3¼ x 4½
1933 Imperial 8	1395*	126	108@	6.2 to one	3¼ x 4½
1932 Imperial 8	1925	135	125@3200	5.2 to one	3½ x 5
1933 Cust. Imper.	.....	146	135@	6.2 to one	3½ x 5
1932 Cust. Imper.	.....	146	135@	6.2 to one	3½ x 5

* Price of four door sedan.

Following are Chrysler prices:

Body models	Six	Royal Eight	Imperial Eight
Brougham	$795	None	None
Business Coupe	795	$945	None
2-4-pass. Coupe	835	985	....
5-pass. Sedan	845	995	$1395
Convert. Coupe	885	1035	....
Conv. 2d. Sedan	1055	1195	None
Conv. 4d. Sedan	None	None	....
5-pass. Coupe	None	None	....

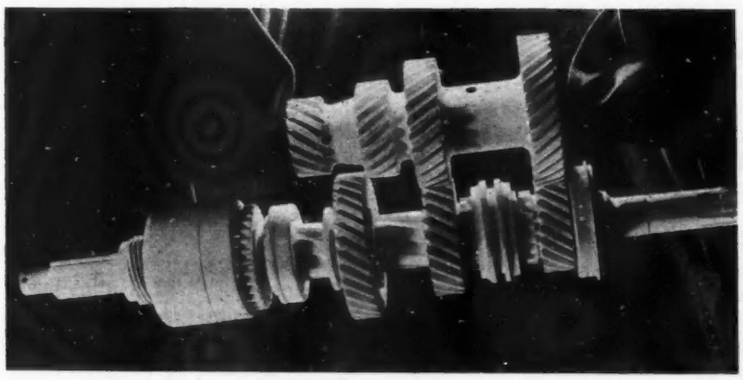
Adoption of T-slot pistons on the entire line, lighter in weight and carrying five rings.

Adoption of coincidental accelerator pedal starter engagement on all lines, eliminating the starter button, by the adoption of a vacuum switch which connects the starter switch to the accelerator when the engine is "dead" and disconnects it from the accelerator as soon as the motor starts. In the six the operation of the starter is mechanical from accelerator pedal by means of connecting links. In the eights the operation is electrical, involving the use of a solenoid on the starter motor for actual engagement of the pinion with the flywheel. On these models also there is an interconnection with the generator to prevent accidental closing of the switch while the motor is running and manifold vacuum is low, as at wide-open throttle.

Adoption of silent-U spring shackles of greater oil capacity on all lines. Lubrication only every 2000 miles.

Power Mark New Chryslers

by Athel F. Denham



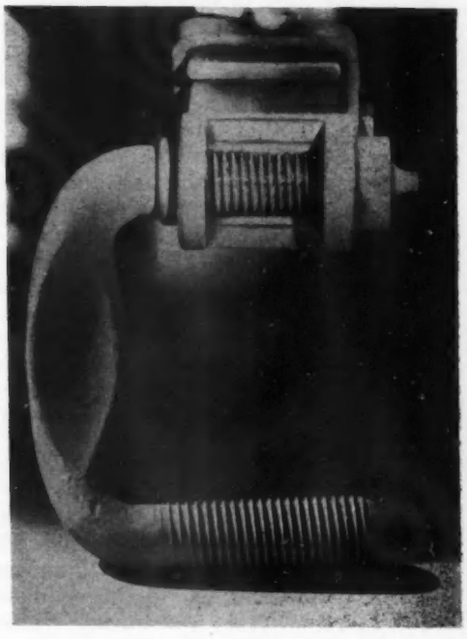
Countershaft and mainshaft of the all-helical gear transmission used in the Chrysler six, Royal eight, and Imperial eight.

the foot is removed from the accelerator for maximum ease of shifting.

Extension of the use of oilite disc spring inserts, preventing squeaks, to all lines.

Adoption of new Delco Products inertia control shock absorbers double acting on the larger eights (previously described in these columns), regulating the amount of shock absorber effect by means of frame movement.

Valve seat inserts for exhaust valves on the entire line of cars, to increase valve life and period between re-grinding. The latter is estimated at around 50,000 miles.



Threaded-U shackles used on all 1933 Chrysler models.

Rubber mounting of all impulse neutralizers on the crankshafts.

Increased cooling capacity on all models and improved pump impellers to increase rate of circulation.

Needle bearing universal joints on all cars, packed in grease at the factory and requiring no periodic lubrication.

Thermostatic automatic idle adjustment on all carburetors, to give a faster idle during the warm-up period to prevent stalling. Operates between idle adjusting screw and its stop.

Four position headlight switch on all cars. Includes a new beam position with the beam illuminating the left of the road depressed to avoid glare, and the one illuminating the right directed well ahead—for country passing. Bulbs of two filament type.

"Solar spark" ignition system on all cars, including coils of increased capacity, high speed breaker arms, and new contact point alloy for longer life.

Improved and lighter X-type frames on all models, with X-member legs carried forward in the side rail to the front cross-member, forming a K-member with the latter.

"Remo" decarbonizers, are standard equipment on the two larger eights, with their high compression heads. Periodically used they dissolve the gum which binds the carbon, loosening the latter so that it is blown out the exhaust.

Manifolds are designed for the ready mounting of automatic chokes which are offered as special equipment on all models.

In addition to these improvements on all models, individual Chrysler cars carry other important refinements. On the Chrysler six there is a new ribbed axle housing lighter in unsprung weight, with the cover plate welded on to eliminate "unnecessary" adjustments in the field.

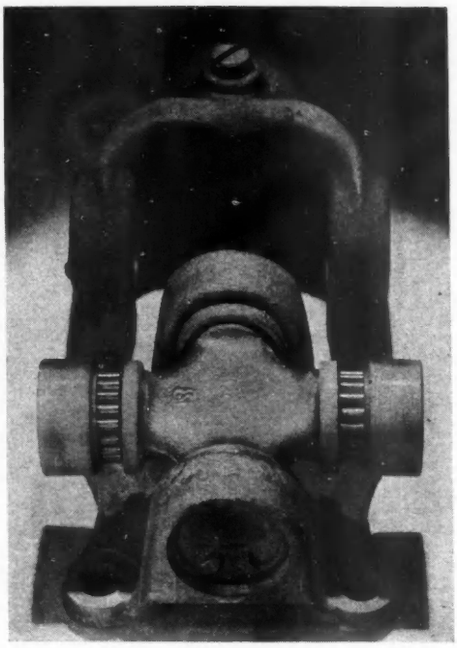
Gear ratio on the six is now 4.37 to one and brakes have 11 in. drums with 1½ in. width lining. There are new Stromberg 1½ in. downdraft carburetors on the six with integral air cleaners and intake silencers. Oil filters are standard.

Radiators have been increased both in frontal area and in thickness of core (now 3½ in.). Capacity is 3⅞ gals. Interchangeable liners are used in the big ends of connecting rods on the six, steel backed and babbitt lined. Valve stems are provided with a relief at the lower end and guides are chamfered for oil control, as on all other Chrysler models. There is a larger (6 in. diameter) Noblitt Sparks muffler to decrease back-pressure, a 16 gal., larger gasoline tank, double taper roller bearings for the worm thrust in the steering gear, with the roller mounted on needle bearings. Steering ratio is now 17 to one for the standard 5.50/17 in. tires. Steering columns are adjustable. Wood or wire wheels an inch smaller in diameter (17 in.) are standard.

Treads on the six are wider, 57-13/16 in. at the front and 59¼ at the rear. Frame section is now 5x2-27/32 x⅛ in. Single acting shock absorbers are standard.

Compared with the Chrysler eight the various mechanical units of the new Royal eight show a heavier rear axle housing, with a 4.30 to one ratio, 12 in. diameter centrifuse drums in the braking system with 1¾ in. lining, oilite clutch pilot bearing, a seven in. diameter parking brake, a ten-inch clutch with 9⅞ in. outside and 6¾ in. inside diameter facings, a new fan, and larger and thicker radiator core, with 4⅞ gals total cooling capacity.

There is a vertical bar grille and thermostatic water circulation control. Bore is the same, but stroke ⅜ in. shorter than on the Chrysler 1932 eight, in keeping with the shorter wheelbase and lighter car weight. Camshafts are drop forged with thrust taken at the front bearing. Additional features include automatic manifold heat control, larger 15 plate battery, a deeper kick-up (2¾ in.) over the front axle for the 6½x9/64x2 in. frame, 16 gal. gas tank, larger 6 in. diameter muffler, new steering gear similar to that on the six, 6.00/17 in. tires on demountable wood or wire wheels, in addition to those already mentioned as being general to all cars. Starter ratio is 16.22 to one and breaker gap on the new distributor .018 in. There are two tail lights, two front mounted horns, four in. single bar bumpers as on the six, with bumperettes in the rear with five wheel equipment (bumpers standard at extra cost).



Needle bearing joints are used on all Chrysler models.

Comparing the new Imperial eight with the Chrysler eight of last year, which sold at higher prices, there are a heavier rear axle, larger parking brake, centrifuse brake drums, wider treads, oilite clutch pilot bearings, new fan with ball bearing mounting, larger radiator core, elimination of radiator shutters by adoption of circulation controlling thermostats in the increased capacity (5-gal.) cooling system.

Horsepower with the standard head is higher than last year by virtue mainly of a higher compression ratio involving the use of anti-knock fuels. There are in addition an automatic manifold heat control, a 6½ x 2 x ⅛ in. frame side rail, coiled springs in the clutch eliminating the need for the former rubber damper used in the emergency brake drum (the latter is retained on the Custom Imperial) and the various new features listed previously as common to all cars.

High compression heads are also standard on the Custom Imperial.

Four body types are common to the six, Royal and Imperial eights, a rumble seat coupe, four-door sedan, convertible sedan and convertible coupe. On the six and Royal eight there are also business coupes, while the six line includes a 2-door Brougham, and the Imperial eight a 5-passenger coupe.

JUST AMONG OURSELVES

Ayres Looks to 1933—

LEONARD P. AYRES is bullish on the automobile business for next year—at least his prediction about car and truck production for next year was optimistic as compared to most of the prognostications about general business which he made to the more than a thousand Cleveland Chamber of Commerce members closely packed together at luncheon on Dec. 13.

Total output of cars and trucks in 1933, the Cleveland Trust soothsayer believes, will be not less than 1,250,000 and not more than 2,000,000. That is to say, he doesn't think the automobile business will be any worse next year than in 1932 and it may be a darned sight better.

The strongly optimistic character of this specific automotive forecast becomes apparent when one looks over the six other specific predictions which he made at the same time, namely that in 1933:

(1) Exports will be less than in 1932; (2) wage rates will be lower; (3) cost of living will be lower; (4) commercial failures will be greater; (5) total amount paid out in dividends will be less; (6) and the average rates of interest will be lower.

Batting Average Mighty Fine

WE were enabled to attend this Ayres luncheon meeting through the combined courtesies of John Love, authoritative financial and economic writer of the *Cleveland Press*, and of Folsom Taylor, the manager who is putting new life into the Hotel Center (the old Newton to you!) These official gatherings of Cleveland business to hear Oracle Ayres have become annual events of great moment in the economic life of the Middle West, not to say of the nation. Each year they are becoming more popular and more important. This year the attendance and the attention, we were told by those who had been there before, reached new high points. And well may they continue to grow, because Mr. Ayres has been right on a surprisingly large number of his gueses.

In his forecasts for 1932 he made 12 definite predictions. Eight of them turned out to be right. "That," Mr. Ayres said, "I consider to be a moral victory." We think he was modest. We don't know of any other predicters with so good a record. Personally we went easy on predicting last year, which saved us from being wrong on more counts than we were.

The bacilli of forecasting does infect practically every editor at this time of year, however, and despite long years of service, we don't ever seem to become immune to its potent powers. So while the fever is on us we submit the following:

We believe that 1933 will see an output of somewhere between 1,200,000 and 1,600,000 passenger cars. We think that 1,350,000 may turn out to be fairly accurate, provided dealer stocks at the end of 1933 are no higher than they are at the end of 1932. Truck production we would guess at 300,000.

Active or inactive selling, sound or unsound merchandising on the part of manufacturers, dealers and salesmen, we believe, may make a difference of 100,000 to 200,000 cars one way or the other. On a percentage basis, these factors will make an even greater difference than that in the totals achieved by any individual producer.

Certainly Hudson Has Canadian Plant

"OUR Canadian Department," writes J. Edward Schipper, who so ably directs publicity for Hudson, "is being bombarded with inquiries as to why no mention whatever was made in your article in the Dec. 3rd issue of *Automotive Industries* of our Canadian plant at Tilbury, Ontario. This plant, as you know, has been running since January 1, 1932, and has been very successful."

We did know it—which makes its omission from the list of Canadian manufacturers published with the Dec. 3rd story all the more embarrassing. Trouble was due entirely to lack of care on our part. We just picked up a list given in a 1931 report by the Canadian department of commerce and slapped it into our story without the careful checking which it should have had. So this note, Mr. Schipper, is our attempt to "make it very clear that Hudson Motor Car Co. is operating a plant at Tilbury, Canada."

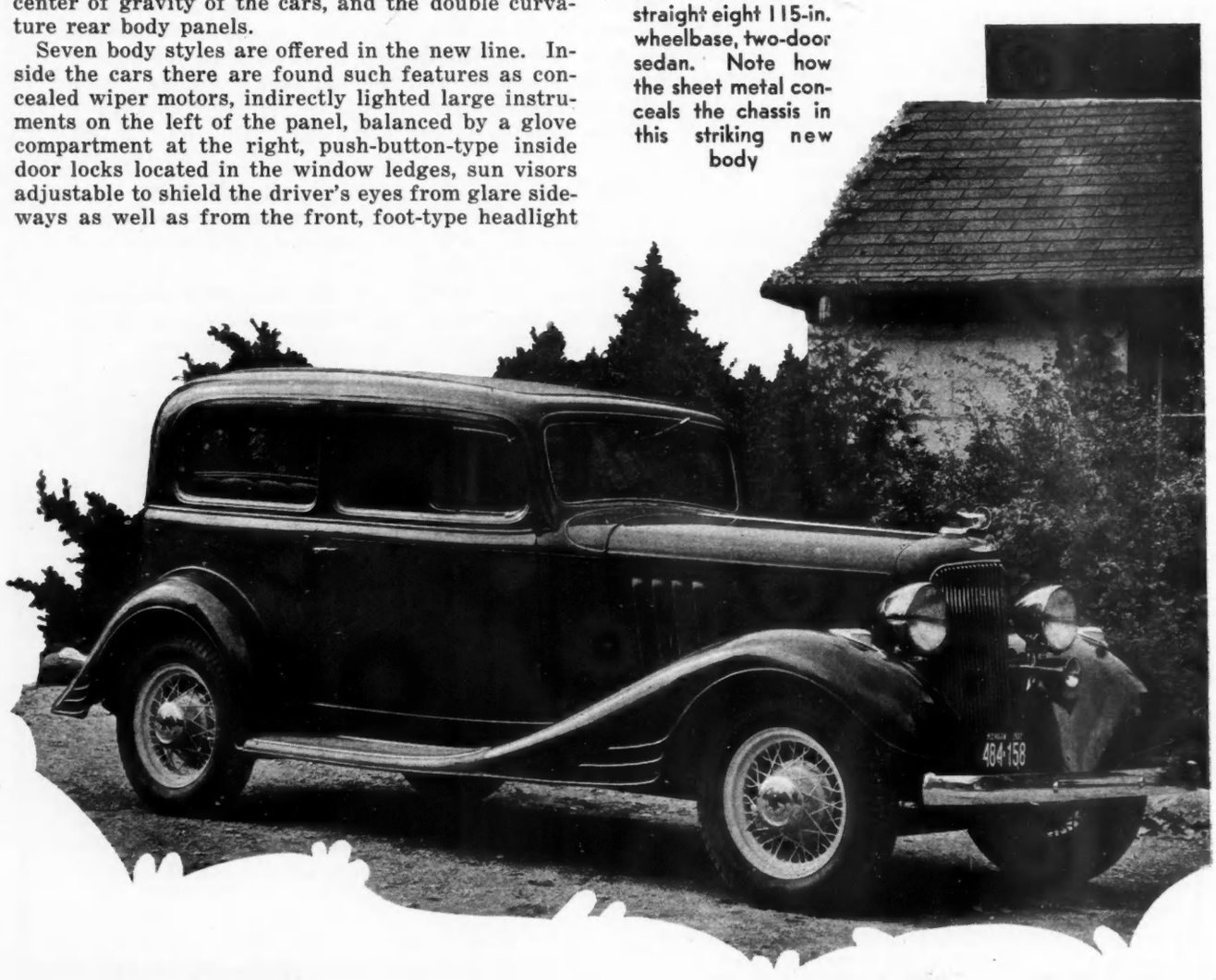
Incidentlly we received in the same mail as Mr. Schipper's letter a report from an outside source indicating that the Terraplane is doing well in the export market in general.—N.G.S.

Pontiac Enters 1933 with Single

FOR 1933, Pontiac Motor Car Company presents one line of cars, a completely new straight eight to sell at phenomenally low prices. It has a wheelbase of 115 in., a 223 cu. in. engine developing 77 hp., bodies entirely new in styling, a top speed of between 75 and 80 m.p.h., synchromesh quiet-second transmission, torque-tube drive, a new method of five-point engine mounting to isolate vibration, the new Fisher controlled-ventilation system in the bodies, and a host of other features.

The accompanying illustrations give some idea of the striking new bodies. Attention should be called here to the new fenders, ribbed for strength as well as appearance, the running board curving upward into the front fenders, the sloping hood louvers located well back of the hood—effective in increasing the appearance of length in the car—concealed hood hinges, central locking and lift handle for the hood, the two-piece V-shaped radiator grille, the small 17-in. wheels which together with a double drop frame account for the low over-all height and low center of gravity of the cars, and the double curvature rear body panels.

Seven body styles are offered in the new line. Inside the cars there are found such features as concealed wiper motors, indirectly lighted large instruments on the left of the panel, balanced by a glove compartment at the right, push-button-type inside door locks located in the window ledges, sun visors adjustable to shield the driver's eyes from glare sideways as well as from the front, foot-type headlight beam control switch, shatterproof glass in the windshields, which are locked in place with the new ventilating system; concealed pawl rod in the hand brake lever; hand-brake lever mounted on the body and pedals on the frame to insulate them from power plant vibrations, etc., friction locks for the choke and throttle control buttons to prevent "creeping"; rubber bumpers on both forward and rear pillars for all doors. An unusual structural feature is that the upper flange of the running board apron, integral with the running board, is not clamped between body and frame but is free to move relative to both, being insulated from the body by a rubber strip on top of the flange. The center-point mounting of front fenders and radiator is also new to Pontiac. These units are mounted on a separate cross-member flexibly attached to the frame at only one point at the center. They are, therefore, free to move with the body rather than the frame, and are tied in to the

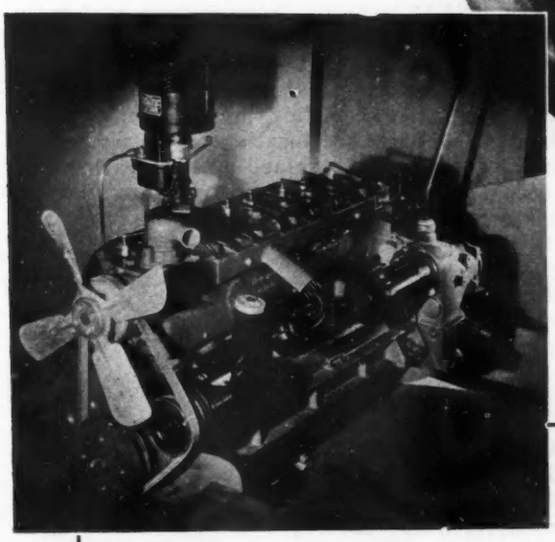


The new Pontiac straight eight 115-in. wheelbase, two-door sedan. Note how the sheet metal conceals the chassis in this striking new body

Line of Eights and 7 Models

by Athel F. Denham

Detail of the new Pontiac straight eight. The grille is made in two pieces. The radiator ornament is standard



Accessories side of the new Pontiac eight engine showing the solenoid on the starter motor, four-bladed unequal spaced blade fan, the interesting wiring manifold, and deeply ribbed crankcase

body for this purpose through the hood and radiator braces. The weight of the four-door sedan, ready for the road, is roughly 3265 lb.; the shipping weight of the two-door sedan is 2935 lb.

No attempt will be made here to go into all the details of design in the new Pontiac eight. Basically the engine is of the "square" type, bore and stroke being approximately equal (3 3/16 by 3½ in.) The crankcase of the engine extends some 2½ in. below the center line of the crankshaft, for maximum rigidity, with parallel ribs on the case adding further in that direction.

Crankshafts, it will be noted, are counterweighted, are fitted with a harmonic balancer, and have overlapping main and crankpin journals. The five main bearings are line-reamed in the case without shims, and are steel-backed, babbitt-lined. Thrust is taken at the center bearing.

Connecting rods are of cruciform section, rifle-drilled for pressure lubrication to the piston pins.

Body Models and Mechanical Details

2-door sedan
4-door sedan
2-4p. sport roadster
2-p. business coupe
2-4 p. Sport coupe
2-4 p. convertible coupe
5-p. 2-door touring sedan (with trunk)

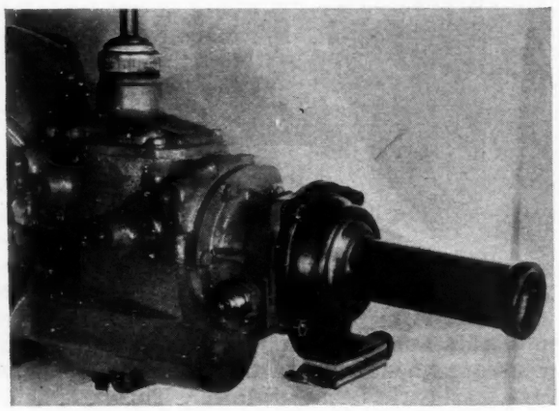
Specifications:

Wheelbase	115 in.
Tire size, in.	5.50/17
Engine make & model	Own
No. cyls. bore & stroke	8-3-3/16x3½
Taxable hp.	32.6
Piston displacement	223.4
Weight cu. in. 5-p., 4-door sedan	
Hp. per cu. in.	0.35 hp.
Max. hp. at spec. hpm.	77-3600
Engine rpm. mile	
Weight cu. in. 5-p. 4-door sedan	
Compression ratio	5.7 to one
Valve arrangement	L-head
Camshaft drive	Morse
Piston material	C. I.
Crankshaft counterbalance	Yes
No. main bearings	5
Oil pressure to main bearings	Yes
camshaft brgs	Yes
wristpins	Yes
crankpins	Yes
timing drive	Yes
Oil cleaner make	None
Crankcase ventilator	Yes
Air cleaner make	A.C.
Engine Temp. control	Thermostat
Carburetor make	Carter
Fuel feed	AC pump
Ignition make	D-R
Gener. & starter make	D-R
Battery make	Delco
Capacity, amp. hrs.	94
Engine mtg.	??
Clutch type and make	P-own
Transmission make	Muncie Prod.
No. forward speeds	3
features	synchro-mesh
freewheeling	none
Universal, type, make	Metal-own
Rear axle type	½ floating
make	own
Torque medium	torque tube
Brakes, service	mechanical
hand, location	service
drum type	pressed steel
Steering gear	Sag. Prod.
Shackles make	own
type	metal and rubber
Springs, length, front	36 in.
rear	54 in.
width, both	1¾ in.
Chassis lubrication	Zerk

An interesting production method is used to obtain equal weight and balance for all rods. The rods have two bosses, one being located at the bottom side of the big end, from which material is milled to obtain correct location of the center of gravity, during balancing; the second on opposite sides of the rod web near the center of gravity. After balancing for weight distribution, these two flats are milled off to obtain the correct total weight of the rod as specified, the cutter removing correct equal amounts from both sides.

Cast-iron pistons are electroplated as formerly. All pistons are machined to the same weight within 1/8 oz. In the valve mechanism are found 30 deg. intake valve seats, valve guides tapered to give a better fit and reduce seating noise, valve-spring dampers, tapered cam faces on the camshaft to impart a turning motion to the flat head tappets, and a camshaft carried in steel-backed bearings, also line reamed in place.

The oil-pump and distributor drive shaft extends through the crankcase at an angle of a little more than 30 deg. to the horizontal between cylinders Nos. 3 and 4. The cylinder head may be removed without disturbing the distributor. Water pump, fan, and generator are driven by a V-belt. The water pump is of the same general design as in the Pontiac six, with vanes in back of the impeller relieving the thrust on the rear bushings. Bushings are of graphite bronze with an oil pocket for six months supply of lubricant.



Detail of the rear of the powerplant showing the rear engine mounting

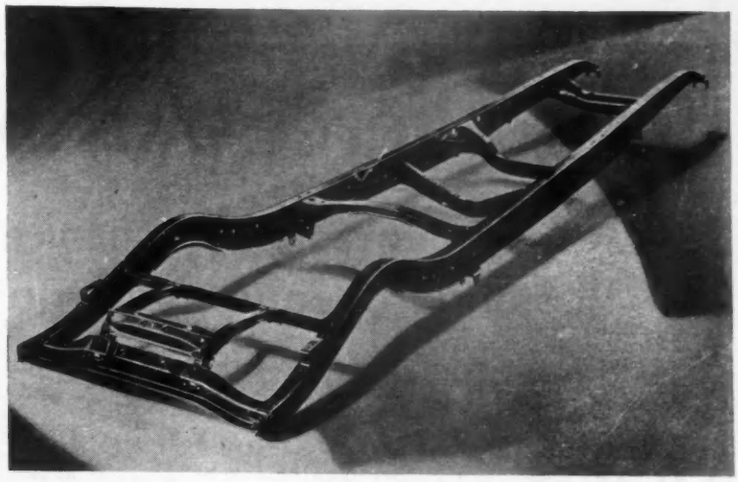
The cooling system has a number of interesting details. There is a main water distributor in the form of a triangular tube, inserted in the block from one end. From this distributor, cooling water impinges directly on the individual exhaust ports. A thermostatic valve is located in the cylinder-head outlet. When it is closed the water circulates back through the pump. Water jackets on the cylinders extend to below the plane of the piston head in its lowest position. The Pontiac cross-flow radiator is continued, but has a new core with wave-shaped fins claimed to be 10 per cent more efficient than a comparable cellular type.

In the full-pressure lubrication system the main lead is drilled in the crankcase fin. Five transverse drill holes provide leads to all crankshaft and camshaft bearings. An interesting detail is the provision of a ball check valve at the rear main bearing to prevent oil leakage at that point due to piling up of lubricant in the rear half of the case while climbing a long hill or while accelerating. A better gasket seal for the crankpan is obtained by corrugating the flange of the oil pan. Valve-chamber covers are also designed to be oil-tight and are fitted with felt insulation to reduce audibility of tappet noise. Another neat little design detail is the coupling of the two shafts driving the distributor and oil pump by milling a slot through both and taking the drive through springs inserted through this slot. This permits of ample clearance between the two shafts where they fit into each other—for alignment—without looseness.

Pontiac does not recommend the changing of crankcase oil at definite periods but only when an investigation shows it to be necessary. The crankcase is ventilated.

Brakes on the new Pontiac eight are now of the Huck type as used on other General Motors cars

Connecting rods on the Pontiac eight are rifle drilled and have a section in the form of a cross. The "flats" on the rod are for balancing the rod both for total weight and for location of center of gravity



Stability is obtained on the new Pontiac eight without use of an X-type frame

Manifolding is of a new type. While the Carter triple venturi carburetor, with a two-section butterfly choke valve, is of the downdraft type, the main branches of the intake manifold rise from below the heat interchange chamber toward the end. This prevents the distribution of wet fuel accumulated in the center of the manifold to the cylinders. Heat control is automatic, through a thermostat. The carburetor also incorporates an economizer for part throttle loads and a pneumatic accelerating pump. A combination air cleaner and intake silencer is standard equipment. The muffler is of the resonance type; it is mounted in rubber grommets and has a notch cut in the tail pipe to prevent exhaust "boom."

The electrical system includes a double-breaker distributor, a 15-plate battery in a 13-plate case for increased maximum amperage for cold weather starting, a flat spark-plug cable manifold in which the cables to cylinders in direct succession are separated and grounded to the block to eliminate induction effects, and a solenoid on the starter motor to close the starter switch for the Bendix engagement, operated by a simple push-button on the instrument panel.

The engine supports are located as follows: There are two at the front of the rubber pneumatic type to control and limit engine movement and take part of the engine load during acceleration; there are two at the sides directly opposite the center of gravity of the engine, to take virtually all the engine load, and there is one at the rear under the torque tube flange, serving as a steady rest for the torque tube and to take part of the load under deceleration. The two center mountings are at an angle in a circle about the center of gravity, permitting therefore, a limited amount of engine oscillation about its neutral axis.

In the chassis the driving units are composed of a 10-in. clutch with spring-cushioned drive, a synchromesh transmission similar to that used in the 1932 Pontiac Vee eight, a torque-tube drive with a tubular propeller shaft, integral with the rear axle pinion shaft, and a new rear axle. It has a flange integral with the axle shafts, eliminating the wheel hub, and is carried at its outer end on a Hyatt roller bearing.

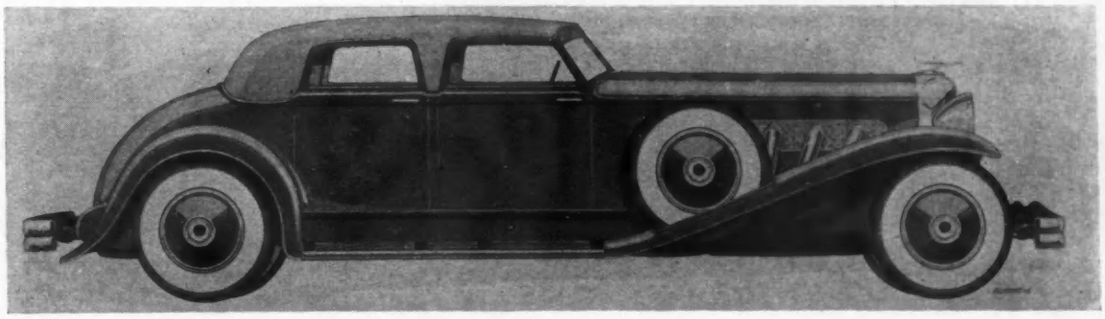
(Turn to page 818, please)

Duesenberg Arlington Sedan

THIS Duesenberg Arlington sedan is built on the 153½ in. supercharged chassis, is capable of 130 m.p.h., 102 m.p.h. in second gear. It is semi-streamlined, from the V-type windshield, slanted at an angle of 36 deg., to the well-formed rear deck which accommodates luggage.

The front end is extremely long and sleek in appearance, due to the absence of cowl bands and a continuance of the hood hinge from the radiator to the windshield. Exposed exhaust manifolds are covered with polished flexible stainless steel tubing. The entire car is finished in chromium color, striped in dawn beige. It is upholstered in imported broadcloth to match the color. Upholstery and cowl are bound with patent leather of the same color.

It is a four-passenger car, the design of the rear and front seats conforming to the idea of four individual chairs. The interior is paneled with two tones of burl walnut with silver inlay. There is an instrument panel on the back of the front seat as well as the one in front, both of which are covered by burl walnut. The rear instrument panel contains a special compass, a speedometer, and a split second stop-clock. The body is by Rollston.



1933 Pierce-Arrow

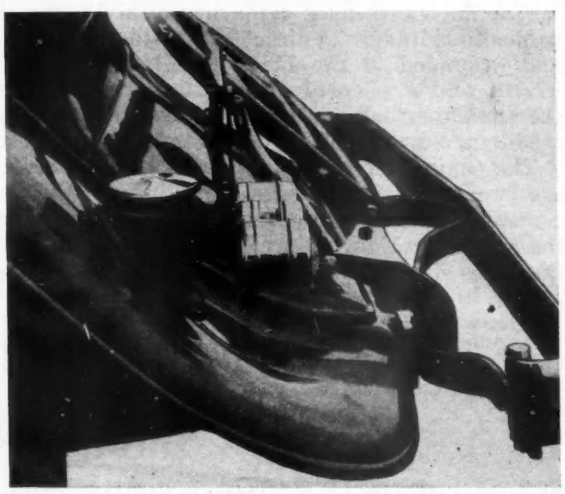
—first to adopt mechanical power brakes as standard equipment on new eight and twelve cylinder lines

MECHANICAL power brakes—adopted for the first time as standard equipment on any American passenger car—an entirely new automatic hydraulic valve lifter, and a multitude of refinements in engine design are outstanding features of the 1933 line of Pierce-Arrows which are announced with new low prices.

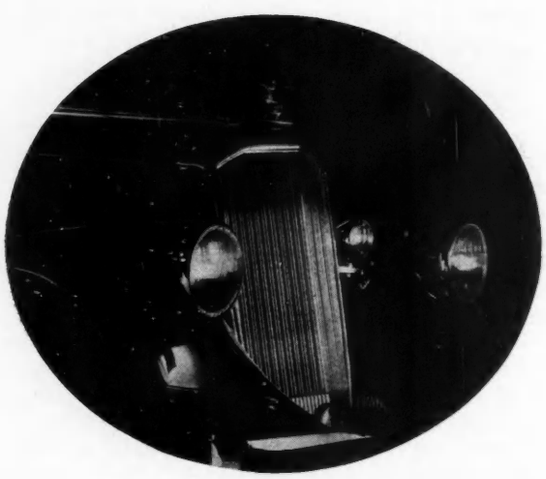
The 1933 Pierce-Arrows consist of two entirely new production models, designated as the 836 and the 1236 and priced from $2,385 to $3,375; two "salon" models on the same chassis as the 836 and 1236, referred to as the 839 and 1239, and priced from $2,550 to $3,540; and two lines of Custom models, 1242 and 1247, on a different chassis, priced from $3,100 to $7,200.

The 836 and 1236 are powered by a new eight- and a new twelve-cylinder engine, respectively. New features of these chassis, in addition to the power brakes which all models carry, include a frame with six cross members, four of which are of the box-section type; rear axles of the worm-drive type; front-axle centers of revised design, and new roller-bearing universals.

The chassis of the Custom line still has hypoid-gear rear axles and in many other respects resembles the chassis of last year's models, but it carries a special 175 hp. 12-cylinder engine and embodies the

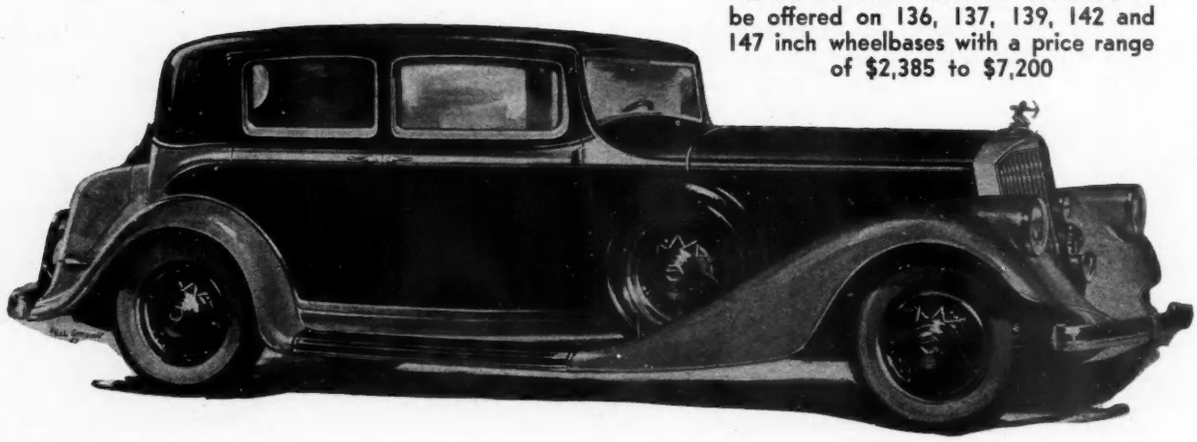


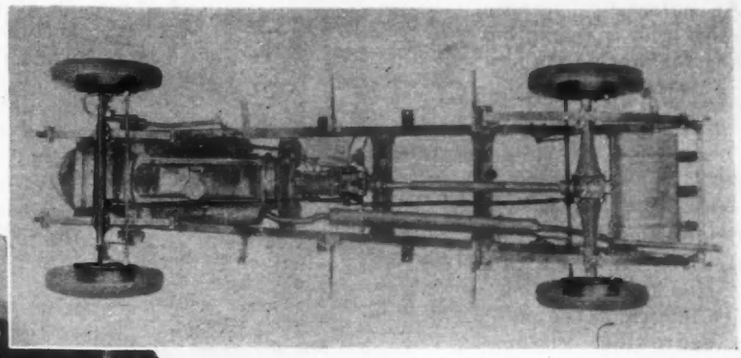
Rear lights, number plate bracket and fuel filler pipe have all been assembled in a neat unit

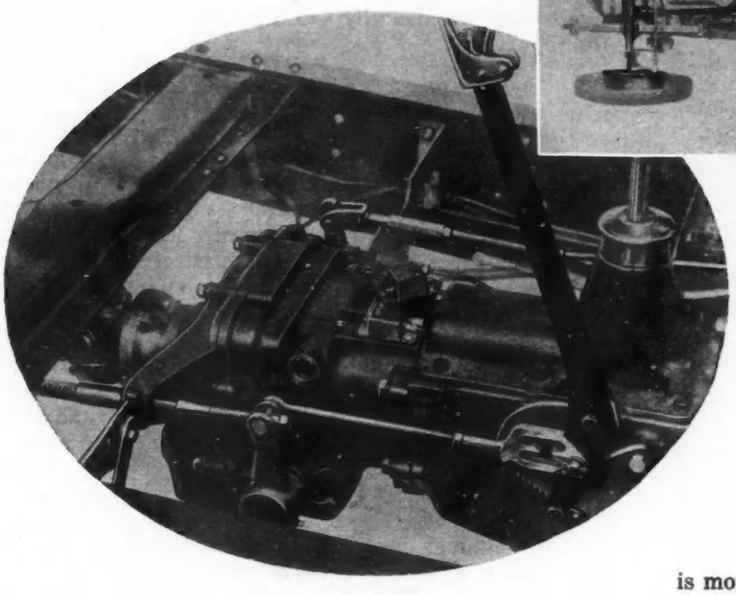


The front lines are pleasing to the eye and remain distinctive of the maker

The Pierce-Arrow lines for 1933 are to be offered on 136, 137, 139, 142 and 147 inch wheelbases with a price range of $2,385 to $7,200







Mechanical power brakes have been adopted as standard equipment

In the oval illustration is shown the brake power unit and the emergency brake linkage

new features included in the production models. Models 1242 and 1247 (the Custom line) have a 12-cylinder 80-deg.-V, 3½- by 4-in. engine (462 cu. in.) which develops 175 hp. at 3400 r.p.m. Models 1236 and 1239 have a 12-cylinder 80-deg.-V, 3⅜- by 4-in. engine (429 cu. in.) which develops 160 hp. at 3400 r.p.m., and Models 836 and 839 are equipped with an eight-cylinder in-line engine of 3½- and 4-in. bore and stroke respectively (366 cu. in.) which develops 135 hp. at 3400 r.p.m. In the eight-cylinder engine the compression ratio has been increased to 5.5 and in the 12-cylinders, to six. Satisfactory performance is said to be obtained without resort to the use of premium fuels.

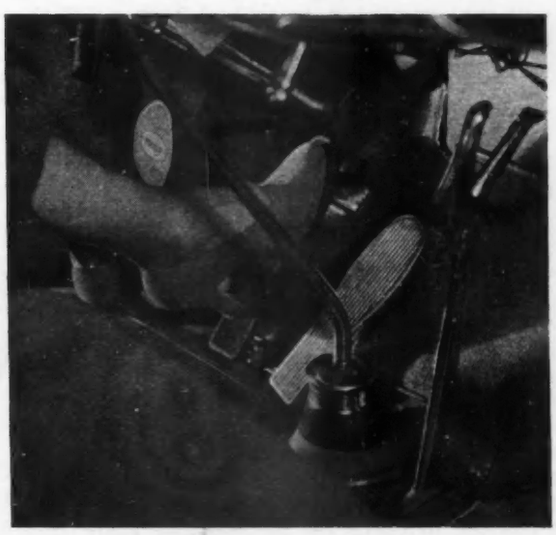
All engines are mounted on rubber. On the 836 and 1236 chassis the front end of the engine is rigidly bolted to a frame cross member which has its ends mounted on rubber blocks on the side rails. At the rear the engine is supported on a frame cross member just ahead of the transmission. A plate is inserted between the engine and transmission housings, whose ends are carried on the frame cross member between thick lower and thinner upper rubber blocks. This arrangement brings the points of elastic support closer to the axis of the engine and makes the rubber cushion more effective.

Cylinder blocks of the 12-cylinder engines are now made of electric-furnace chromium iron, which is harder than ordinary gray iron and, therefore, offers greater resistance to abrasive action on the cylinder bore and to pounding of the valves on the valve seats; and it is said to be also more resistant to corrosive influences in the cylinder jackets.

Valve passages have been redesigned so as to give a freer flow of the gases. This assures a higher volumetric efficiency and is said to also decrease the tendency to detonation.

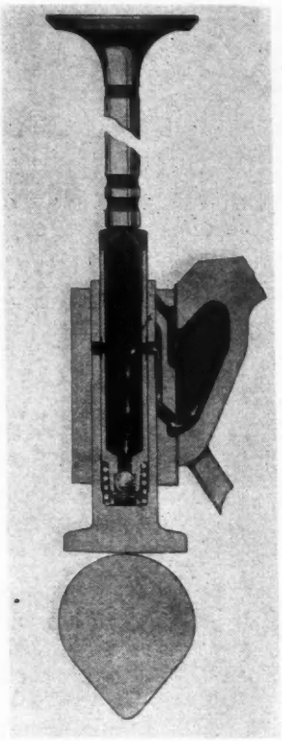
The 12-cylinder engines have their crankshafts mounted in seven bronze-backed, babbitt-lined bearings with an aggregate bearing surface of 58.75 sq. in. Counterweights are forged integral with all crank arms. The crankshaft of the eight-cylinder engine is mounted in nine bearings of the same type as used in the twelves, with an aggregate projected bearing area of 112.6 sq. in. It has four bolted-on counterweights. A torsional vibration damper is fitted, of the type in which the energy of vibration is absorbed in a disk of rubber vulcanized to a flange on the crankshaft and a small inertia mass.

All connecting rods are matched for weight to within ⅛ oz. At the big ends the babbitt is spun in, and the bearings are finished by diamond boring. A radial hole is drilled through the big end of the rod for squirt-lubrication of the thrust side of the cylinder wall. In the 12-cylinder engines connecting rods are mounted on the crankpins side by side and are rifle-drilled for pressure-lubrication of the piston pins.



With power braking driving becomes somewhat simpler, particularly for the lady drivers

An automatic hydraulic valve lifter is among the new features on the new Pierce-Arrows



Pistons are of Lynite, with invar struts. Skirts are slotted over their entire length on the non-pressure side. Pistons are matched for weight to within ⅛ oz. In the 12-cylinder engines the floating piston pins are retained. Bronze bushings for the upper ends of connecting rods are diamond-bored. In the eight - cylinder engine the piston pin has bearings in the piston bosses only.

All engines have four Perfect - Circle rings per piston, all located above the piston pin, three of these, ⅛ in. wide, being compression rings, and the fourth, 3/16 in. wide, an oil-control ring. The single camshaft of the 12-cylinder engines is mounted in four steel-backed, babbitt-lined bearings graduated in size from front to rear; that of the eight-cylinder engine has six such bearings. Lifts are 5/16 in. in the twelves and 11/32 in. in the eight. In all engines the camshafts are driven by single Whitney chains running over steel sprockets on the crankshaft and cast iron sprockets on the camshafts.

Engine lubrication is by the pressure system through main distributing galleries and drilled passages from same to the main bearings. Oil is taken into the pump through a Floato inlet. The oil is filtered by means of a new full flow-type cartridge filter manufactured by Purolator; the latter is provided with an emergency valve which opens if the filter becomes choked for any reason. An automatic oil temperature regulator of the Harrison Viscon type is located in the line between the filter and the engine. This unit also has a safety valve, which causes the oil to be by-passed around the regulator when the pressure in the line reaches a certain value.

An entirely new feature of this year's engines is the hydraulic automatic valve lifter. Use is made of the pressure in the engine lubrication system for keeping the clearance in the valve-actuating system automatically taken up, thus assuring quiet action. Referring to the sectional view of the lifter, oil is forced into the chamber within the lifter plunger through the guide and ports in the lifter body. A light spring at the bottom of the plunger holds the lifter in the no-clearance position when it is not subjected to the lifting pressure. This leaves a space beneath the plunger which is immediately filled with oil from the oil pocket. A small check valve in the bottom of the plunger prevents the escape of this oil when pressure is applied to the plunger. Any loss of oil by leakage is replaced the moment the pressure on the plunger ceases.

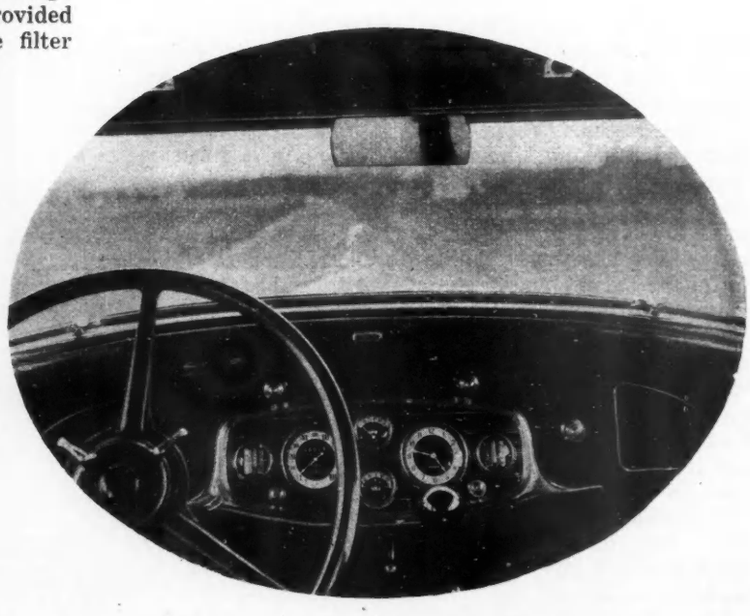
At the upper end of the lifter is a hardened insert, with a central 1/32 in. hole which is closed by the valve stem. This provides for the escape of any air which may accidentally get into the chamber inside the plunger.

Downdraft Carburetor

A downdraft type of Stromberg carburetor is now used on the eight-cylinder engine. It has a fast-idling feature, which keeps the engine running at a speed corresponding to about 15 m.p.h. road speed until it has reached a temperature permitting it to idle slowly. The engine then slows down automatically. The carburetors used on the twelve-cylinder engines are similar to those used last year, but of increased size, with improved throttle shaft, enclosed accelerating pump mechanism, and the new "fast idle" feature. The two carburetor throttles on the twelves are independent of each other in the closed position and are "picked up" by a fork on the carburetor cross shaft. By means of an adjusting screw on the cross shaft the two throttles can be "synchronized" so as to begin to open at exactly the same time. To shield the carburetors against heat from the manifold, a heavy fiber spacer is placed between the two units and a fiber gasket is inserted between the main throttle barrel and the upper carburetor inlet section.

Automatic Choke

All engines are provided with an automatic carburetor choke. When the engine cools, the choke valve is closed by a thermostatic spring and latched in this position. When it is started, the vacuum produced unlatches the choke. This choke valve is an unbalanced valve which tends to open against the pressure of the thermostatic spring, under the influence of the vacuum in the manifold. When the engine warms up, the thermostatic spring, which is mounted where it will



An instrument board of unusual design

be heated by the exhaust manifold, becomes weaker and allows the valve to open farther, until at normal engine temperature the valve is held in the fully open position.

Fuel tanks on all cars have a capacity of 27 gal. The fuel line runs outside the frame rail nearly the whole distance, for insurance against vapor lock, and connection from the side rail to the Stewart-Warner fuel pump is made by flexible tube, to compensate for relative motion between engine and frame. An extra capillary tube runs from the tank to the King Seeley gasoline gage on the dash.

Square-section manifolds have been replaced by a round-section type, of increased cross section. In the 12-cylinder engine there are two inlet manifolds, one for each bank of six cylinders, with an internal diameter of 1½ in. Sharp turns are avoided in the design of these manifolds. Exhaust heat to the inlet manifolds is controlled by thermostatic valves. Each manifold has its own thermostatically controlled heat valve, and these valves are entirely automatic. The eight-cylinder engine has a duplex manifold of a similar design, also with thermostatically-controlled heat valve.

Air Cleaners and Inlet Silencers

Combined air cleaners and inlet silencers are mounted on the forward end of the carburetor air inlet. A small tube connecting the rear valve cover with the carburetor air intake draws oil vapors from the crankcase, and a device at the inlet end of this tube is designed to separate any oil globules from the vapors.

Fin-and-tube-type radiators of Long make, with copper cores, are used. To add to the mechanical strength of the core, the outside "tubes" are made solid, so they take practically all of the stresses due to frame distortion, etc.

The radiator fan, on a Schwitzer-Cummins roller-bearing hub, is driven by two V belts from the crankshaft. These same belts serve to drive the generator, and through it the water pump, which is mounted on the side of the crankcase.

All ignition systems are of Delco-Remy manufacture. In the 12-cylinder engines a dual-coil, dual-point system is used, while the eight has a single-coil, dual-point system. Spark timing is effected by means of a push-pull buttom on the dash, but all ordinary timing control is by a spark governor built into the ignition unit. All engines are equipped with Champion spark plugs, the 12-cylinder models carrying 14-mm. and the eight, ⅞ in. plugs. All spark-plug cables are carried in a metal conduit.

Both the eight and the twelve-cylinder engines exhaust through single exhaust pipes, and through two "straight-through" mufflers mounted in tandem. It is claimed that the lining of the exhaust pipes (already referred to) not only reduces the amount of heat escaping from it into the engine compartment, but deadens noises from the pipe. Both mufflers are lagged, to minimize the radiation of heat from their surfaces. Contrary to previous practice, there is no filling or acoustic material in the mufflers, but both are of the tuned-frequency type, the principle of action being the reverse of that of musical instruments, in that sound is absorbed instead of being amplified. The various parts of the muffling system are suspended from the frame through rubber-insulated brackets. The frames of the two new chassis have channel-section side members with 8 by 2½ by 5/32 in. maximum section. They have a total of six cross members, four of them of the box-section type, for increased rigidity.

The Ross steering gear is essentially the same as on last year's cars; it has a 20 to 1 gear ratio. The slope of the steering column can be adjusted. Only two tubes pass through the steering column, for the light control and the throttle lever respectively. A three-spoke steering wheel is fitted.

Demountable wheels with drop-center rims, in both the wire and wood-wheel types, are available as standard equipment. The Customs line comes with 17/7.50 tires, while the two other lines carry 17/7.00 tires. The valve stems come through the rims at an angle, which makes them more accessible for inflation.

Rear Axle, and Transmissions

For the two new models the worm-drive type of rear axle has been adopted.

Universal joints are of the Universal Product Co.'s needle-bearing type. Propeller shaft diameters have been increased to 3 in.

Transmissions are of the three-speed, synchromesh, free-wheeling type, with the following gear ratios: Low, 2.83; intermediate, 1.70; high, 1.00; reverse, 3.40. First-reduction and intermediate-speed gears are cut with helical teeth and finished by a lapping process. The pilot bearing of the splined shaft is a roller bearing. The complete transmission is secured to the clutch housing by means of four cap screws.

The free-wheeling and brake units are contained in a separate housing secured to the rear of the transmission housing. The free-wheeling unit contains eight ⅜ in. rollers, each mounted in its own compartment and having its own locking ramp. Where previously the rollers were the sole means of centering the unit with respect to the shaft, it is now centered by means of eight bronze bearing shoes, one at the top of each ramp. A mechanical lock is provided on the right side of the unit which prevents the transmission from being thrown into conventional gear from the free-wheeling position unless the clutch pedal is depressed. The free-wheeling and brake units use the same lubricant as specified for the transmission.

The Braking System

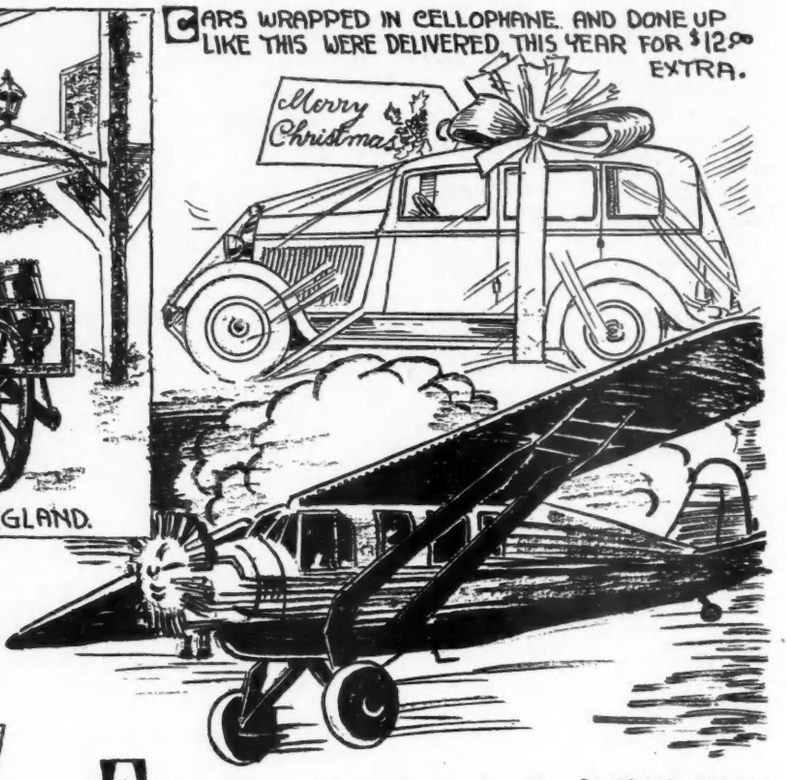
The braking system is described as of the automatic-power, mechanically-applied, four-wheel type, and was developed in collaboration with Stewart-Warner. An illustrated description of this power unit appeared in Automotive Industries of December 26, 1931. The unit is filled with oil and there is said to be no danger of the friction surfaces becoming injured by excessive heat or abrasion. From the distributing lever on the power unit a single cable runs to the front axle and another to the rear axle. These cables pass through what are described as frictionless, greaseless armor, and connect to the brake-actuating camshafts.

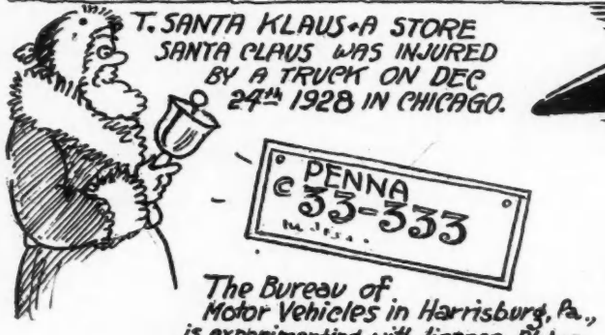
The brakes act on the inside of 16 in. drums made of a steel which is said to offer unusual resistance to wear and scoring. These drums are heavily ribbed on the outside to increase both their rigidity and their heat-radiating capacity.

On the Custom line chassis the type of the ride control valve on the dash has been changed. On the new chassis models the ride control has been eliminated.

The Custom line comes in wheelbases of 137, 142 and 147 in.; while the other two lines both come in wheelbases of 136 and 139 in.

Automotive Oddities—By Pete Keenan





The Bureau of Motor Vehicles in Harrisburg, Pa., is experimenting with license plates that can be used year after year

AN AVIATOR NAMED EARL CHRISTMAS CRASHED WHILE FLYING THE XMAS MAIL ON DECEMBER 24th, 1929, IN ENGLAND.

Write us if you know an Oddity

The NEWS TRAILER

Five million man-hours of labor are furnished the steel industry by every 100,000 Chevrolet sixes delivered to consumers, Paul Mackall, vice-president of Bethlehem Steel wired H. J. Klingler, vice-president of Chevrolet.

Other steel executives said:

J. C. Williams (president, Weirton Steel): "No other industry can contribute as quickly nor as widely to a further improvement as the automobile industry due to their widely diversified requirements and quick consuming ability.

Unquestionably the greatest values ever obtainable are offered today by the automobile industry and coupled with the fact that the purchase of no other article produces as much benefit for the general welfare I look forward to the industry duplicating its performance of 1921 and contributing immediately and materially to further relief of our unemployment condition by supplying business that will permit of further increased operation and re-employment of idle labor."

B. F. Fairless (acting president, Republic Steel): "Increased automobile buying would provide the impetus the steel industry needs. Our business would reflect any upturn immediately by substantial gain in operations and number of men employed."

E. T. Weir (chairman, National Steel): "Steel industry now almost 50 per cent above low point of last summer. Inasmuch as automobile industry is one of the largest consumers of steel, increased automobile buying would have the immediate effect of stimulating our operations and materially increasing employment. The automobile industry can go a long way in bringing us all out of this depression."

William L. Ward (president Russell Burdsall & Ward Bolt & Nut): " . . . as automobile manufacturers take biggest percentage of our total output, an increase in automobile buying would have immediate good effect on our industry.

NEWS

"Terminal Dealer" Key To Continental Plan

Garageman, Druggist, etc., May Get Franchise for New Line of Automobiles

Distribution of the three new lines of Continental cars will follow conventional lines in that they will be retailed by retailers. There are, however, a number of unusual features in the plan, the most novel being the "terminal dealer."

According to dealers, to whom the plan has been presented, the Continental program is about as follows:

The terminal dealer will be appointed directly by the factory thus relieving the direct dealer—or semi-distributor, as he is referred to in the Continental plan—of this expense, and he may be a garageman, repairman, druggist, department store, etc.

In order to qualify for appointment, he must buy one four-cylinder car, which presumably will be used as a demonstrator, as well as for any other purposes the terminal dealer may desire.

The direct dealer will be given exclusive sales rgihts in his sales area and will appoint associate dealers where they may be necessary. On all sales made by associate and terminal dealers, the direct dealer will get a wholesale margin of approximately customary proportions.

Discounts to the direct and associate dealers on the two six-cylinder models will be about in line with the industry's usual practices. On the four-cylinder line, the discount to the direct dealer will be substantially less than is usual and, inasmuch as he will retain about the normal wholesale margin, it follows that the discount on this car to associate and terminal dealers will be narrow. Incidentally, terminal and associate dealers will make the same margin on the four.

Where the terminal dealer gives a prospect for a six-cylinder car to his direct dealer and a sale results, he receives a generous commission.

Judging by the narrow margin on the four-cylinder car, presumably it is expected that the price on this car will be so low that many clean deals will be possible and, where a trade is involved, that it will be possible to get the used car at about its cash price.

Where the terminal dealer does not have service facilities, his margin will be less, the difference going to the direct dealer to cover service expense.

The size of sales areas will, of course, be determined by local conditions. In the larger cities, it is understood, however, that it is planned to have a number of direct dealers, each with a section of the city as his sales area.

While the idea of using repair shops and retailers in other lines as prospect sources is now new, it is believed that the Continental plan is the first effort on the part of a factory to make such outlets a definite and organized part of its sales program.

Another unusual feature of the plan is a direct-mail advertising campaign which will reach substantially every family in the country.

Plymouth Prices Down $20 to $30

1932 Shipments Show Gain of 50% Over 1931 Record, Third Quarter Up Again

DETROIT, Dec. 19—Price reductions of $20 to $30 on various models of the recently introduced line have been announced by Plymouth Motors.

Model	New Price	Former Price	Reduction
Business coupe...	$495	$545	None
Rumble coupe...	525	546	$20
4 door sedan.....	545	575	30
Conv. coupe.....	565	595	30

In connection with this announcement Mr. Chrysler said in part:

"Plymouth is the only motor company to build and ship more cars in 1932 than in 1931 according to the latest figures of the National Automobile Chamber of Commerce.

"In the face of adverse economic conditions prevailing during the past few years, Plymouth shipped 150 per cent as many cars in 1931 as it did in the preceding year and our 1932 shipments are 114 per cent of last year.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, Dec. 22 — General trade in this country during last week was quiet with but a few exceptions.

Reports of holiday trade vary in different sections of the country, but lower prices this year make dollar volumes compare very unfavorably with those a year ago. Retail trade in New England lately has equalled that a year ago; mill activity in that section of the country is below that three months ago, but it is still higher than last year.

Sales of one large mail order house during November were slightly more than 10 per cent lower than those in the corresponding month last year.

FREIGHT LOADINGS

Railway freight loadings during the week ended Dec. 10 totaled 521,216 cars, which marks a decline of 26,245 cars below those during the preceding week, a decline of 92,405 cars below those a year ago, and a decline of 223,137 cars below those two years ago.

STORE SALES

The Federal Reserve Board's index of department store sales, which makes allowance both for the number of business days and for seasonal changes, stood at 64 in November, as against 71 in October and 70 in September.

BUILDING IS OFF

Construction contracts awarded in 37 eastern states during November, according to the F. W. Dodge Corp., amounted to $105,302,300, as against $151,195,900 a year ago.

Contracts awarded during the first eleven months of this year totaled $1,694,098,200, as against $4,186,375,400 in the corresponding period last year.

CRUDE PRODUCTION

Average daily crude oil production in the United States for the week ended December 10 amounted to 2,123,850 barrels, as against 2,127,550 barrels for the preceding week and 2,452,650 barrels for a year ago.

FISHER'S INDEX EVEN

Professor Fisher's index of wholesale commodity prices during the week ended December 17 stood at 58.7, as against 58.7 the week before and 60.2 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended December 14 were 38 per cent below those a year ago.

STOCK MARKET QUIET

The stock market last week was generally quiet. A reactionary tendency was shown in some special issues, notably the oil, steel, and copper shares. Values were strengthened by Great Britain's payment of the war debt installment due this country on December 15, but the market seemed to have discounted France's default. Price changes for the week were slight, but generally lower.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended December 14, showed a decrease of $15,000,000 in holdings of discounted bills. Holdings of bills bought in the open market and of Government securities remained unchanged.

Foreign Motor Men Are Show Speakers

Kettaneh, Head of Syrian Auto Dealers, to Discuss Transport Coordination

NEW YORK, Dec. 20—Visitors from foreign countries attending the National Automobile Show in New York, Jan. 7th to 14, have been invited by the National Automobile Chamber of Commerce to participate in an International Day session, Monday, Jan. 9, to consider the industry's world problems.

"Rail and Truck Coordination as a World Task" is a subject which will be presented by F. A. Kettaneh, president of the Automobile Dealers Association of Syria.

Ellis Hampton, president of the Automobile Dealers Association of Argentina, will discuss trends of motor trade in his country, and H. Bertram Lewis, vice-president, Commercial Credit Co., will speak on "If I Were a Dealer in 1933."

The International Day program is sponsored by the Chamber's Export Committee, of which Robert C. Graham, vice-president, Graham-Paige Motors Corp., is chairman.

Alvan Macauley, president of the N. A. C. C., will welcome the overseas delegates.

Among the prominent foreigners who have accepted the Chamber's invitation according to George F. Bauer, secretary, Export Committee, are:

Arthur A. Rowse, Director of Morris Motors, W. T. Grose and W. S. Thimblethorpe, England: André Dubonnet, manufacturer of a springless French automobile which will be exhibited at the Show, France; Arturo San Roman of Mexico; Maurice Wilford of Belgium; Guido Soria, General Manager and Rodolfo Schaeffer of the Fiat Motor Company, Italy; R. A. de Schausten of Martinique.

A luncheon for the foreign guests will precede the meeting.

Dahl Elected by N. A. C. C.

Election of T. R. Dahl, vice-president, White Motor Co., as a director of the National Automobile Chamber of Commerce is announced by Alvan Macauley, president.

Mr. Dahl is also a member of the Chamber's Motor Truck Committee and has taken an active interest in affairs relating to the commercial vehicle division of the industry.

Nickel Co. Offers Alloying Chart

NEW YORK, Dec. 22—A guide designed as a convenient and quick source from which suitable nickel and nickel-chromium cast iron compositions may be selected for specifications purposes, has been prepared and distributed by the International Nickel Co., Inc.

This is the first of a series of data sheets covering composition and service data on industrial applications of nickel cast iron.

Supplementary sheets devoted to specific applications, such as dies, brake drums, cylinders, grate bars, etc. will be issued at intervals.

Rail Air Conditioning Unit by G. M. Subsidiary

Simplified System Developed by Frigidair and Motors Research

DAYTON, Dec. 22—Complete air conditioning equipment for the railroad passenger field is being introduced by Frigidaire Corp., a subsidiary of General Motors Corp.

The equipment is designed for sleeping cars, club and observation cars, diners and day coaches and is a joint development of G.M. research laboratories in Detroit and Frigidaire.

Test cars were operated in all sections of the country last summer.

A separate factory division to be known as the railway air conditioning division has been established in Dayton for the new sales and engineering activity. Installations will be made in railroad shops.

The mechanical unit consists of a four-cylinder compressor, slung under the car frame, eliminating the necessity for permanently blocking vestibules, for carrying heavy equipment overhead and for taking up revenue producing space.

The refrigerant used has been developed for air conditioning by Frigidaire and Kinetic Chemicals, Inc., subsidiary of du Pont, and is known as Freon.

Pittsburgh Mills Ask Lower Freight Rates

Lake-Front Mills Have Advantage of Lower Costs

PITTSBURGH, Dec. 20— Asking for lower rail rates on steel shipped from here and Valley districts to the Detroit-Toledo district to compete with Lake Front mills having low water rates, local producers have appealed to the Central Freight Association for a sharp reduction in rail rates to the Detroit-Toledo district. A public hearing on the application has been set.

John A. Coakley, general traffic manager for subsidiaries of the U. S. Steel Corp., wrote Eugene Morris, Central Freight Association, that the average amount of steel used in an automobile is 2100 lb. and the automobile output should exceed 3,000,000 cars a year. Steel plants in the Detroit territory have a capacity of approximately 1,000,000 tons a year.

Low water rates have enabled Buffalo, Cleveland and Chicago mills to capture the market in the Detroit-Toledo territory.

Canadian Registrations Show 7.8% Decrease

Total Use of Vehicles Down 89,337 Units in Year, With Total of 1,051,336 in 1932

TORONTO, Dec. 22 — Preliminary 1932 statistics of motor vehicle registrations in Canada indicate a decrease of 7.8 per cent compared with 1931.

Gross sales of gasoline for eight months of 1932 show a decrease of approximately 10 per cent indicating a smaller average consumption per car than in the same period of 1931.

The number of passenger vehicles in Canada is given as 769,284; commercial vehicles 119,135, making a total of 1,051,336, as compared with 1,140,673 at the end of 1931.

The largest decrease in registered motor cars and trucks this past year is found in the wheat Province of Saskatchewan where the total dropped to 88,265 from 104,726 one year ago, a difference of 16,461 or 15.7 per cent. Manitoba, another Western Province, had a decline in registrations of 13.2 per cent, the present total being 64,-800. Alberta was third in the decrease column with a decline of 11.6 per cent, the current list showing a total of 82,933 cars and trucks.

In eastern Canada, the substantial Province of Ontario has held to within 6 per cent of last year's total, the exact decrease being 5.4 per cent, this being the smallest decline of 1932 in Canada. Ontario has 457,613 passenger cars and 59,563 trucks in operation, a total of 517,176, as against 546,836 one year ago.

Quebec was close to Canada's average with a 7 per cent drop to 162,917 registrations, the actual decrease being 12,272 vehicles. The declines in other Provinces were as follows: Nova Scotia, 6.6 per cent; Prince Edward Island, 10.2 per cent, and British Columbia, 6.9 per cent.

The decrease of approximately 10 per cent in Prince Edward Island is interesting in view of the fact that this Province has been somewhat antagonistic towards the automobile in restrictive laws, etc. The total registrations there are 6,879, of which 740 are commercial vehicles.

October Canadian Production Up 25%

OTTAWA, Dec. 22—Production of motor vehicles in Canada during October amounted to 2923 units, gain of 25 per cent over September, and more than double the 1440-car production for October, 1931.

Truck output declined from preceding month, but gains in passenger cars more than offset this.

Only 691 cars of October output were made for sale in Canada, balance being for export.

"Flying Hamburger" Speeds at 96.3 m.p.h.

Maybach-powered Streamlined Railcar Will be Regular Berlin-Hamburg Equipment

BERLIN (*Special*) — The Reichsbahn's new auto-train, "rail Zeppelin" or "Flying Hamburger," carrying officials and invited guests, pulled out of Berlin Dec. 19 on its first trial run to Hamburg, under normal traffic conditions, touching 96.3 m.p.h.

It covered the 178 mi. in 2 hr. and 21 min., cutting down the fastest train time by 38 min. The average speed was 75.8 m.p.h.

On the return trip 8 min. were allowed so as not to interfere with the heavy Berlin suburban traffic in the evening hours. Officials expressed complete satisfaction with both runs.

The auto-train is 138 feet long, and consists of two sections closely coupled and vestibuled over a special truck. It seats 102 passengers and has a baggage and refreshment room.

It drives in either direction, and both ends—or heads—are streamlined. Care has been taken to reduce air resistance as much as possible. Headlights are sunk into the structure.

Power is furnished by two 410-hp. Maybach-Diesel engines with direct-drive generators.

The "flying Hamburger," will be added to the regular timetable next year.

Miller Heads Truck Sales For U. S. Asbestos Co.

Franklin A. Miller, for five years sales representative of "Bus Transportation" in the Middle West, has been appointed manager of transportation sales for the U. S. Asbestos, division of the Raybestos-Manhattan Corp.

He will have charge of development of brake lining sales in the truck, bus and passenger car fleet fields.

Mr. Miller has had a wide experience in the automotive merchandising fields, having been at one time a vice-president in charge of sales of the Gill Piston Ring Co. and previously having been associated with the sales department of Stromberg Carburetor Co. For a number of years he was in charge of the direct mail division of Chilton Co.

Marshall Asbestos Expands Factory

TROY, N. Y., Dec. 19—Marshall Asbestos Corp. manufacturing MAC and Slade brake linings, has recently acnear here.

quired another plant in Green Island

The new building provides an additional 20,000 ft. of floor space.

Several large contracts, deliveries to be made in 60 days, prompted the company to take over this property.

Poag on Dodge Sales Staff

EMERSON J. POAG

A. Vandersee, general sales manager, Dodge Brothers has announced appointment of Emerson J. Poag, recently assistant sales manager for Buick, to his staff.

No specific duties for Poag have been announced. He will be interested in all phases of sales department operations.

Austin Signs Single Exclusive Distributor

ATLANTA, GA., Dec. 18—Exclusive contract for selling the entire production of the American Austin Co., Butler, Pa., has been signed.

For five months the Evans organization has had exclusive sales franchises in 45 states, Mexico and Cuba. Now the remaining states and Canada have been added. The sales concern has 14 distributing and retail branches of its own, and 15 independent outlets work under its direction.

An analogy is seen in the contract given Ray M. Owens in 1905 to take Reo's output for 10 years.

New Battery Concern Formed in Texas

SAN ANTONIO, TEX., Dec. 21. — The Beals Battery Co., which plans to manufacture batteries, has been incorporated. Incorporators are: L. C. Beals, F. W. Beals and Mrs. L. C. Beals.

Atlanta Ford Plant Has New Manager

E. D. Bottom, assistant manager of the Atlanta, (Ga.) plant of Ford Motor Co., has been appointed manager, succeeding F. S. Reinhardt, who has been transferred to the manageship of the Ford plant in Minneapolis.

Steel Mills Selling To Car Plants Busy

Year-end Dullness is Generally Increased as Orders Drop to New Low Level

NEW YORK, Dec. 22.—While the steel market as a whole presents perhaps even more so than in former years an end-of-the-year aspect of dullness, that part of the steel industry catering chiefly to automotive consumers is enjoying a fairly good rate of operations.

The broadening of the assembly programs of the leading manufacturers of low-priced passenger cars is reflected in a moderate stepping up of operations at some of the sheet and strip mills.

While a small volume of business from steel consumers in other industries has been placed for January shipment, it is generally conceded that automotive demand will be the market's main prop over the remainder of this year as well as in January.

Bookings by members of the National Association of Flat Rolled Steel Manufacturers in November showed a sharp recession from the preceding month, the organization's latest statistical report recording sales of 66,274 tons compared with 94,656 tons in October.

Developments during the past fortnight make it reasonably certain, however, that December will make a much better showing and, in part at least, make up for the shortcomings of November. In the market for wire products better demand for wire rods for automobile chains is reported.

From the shipping instructions that accompanied these orders it is inferred that stocks of chains have run low all over the country and that chain makers are urgently in need of rods to rush through the orders that have come to them.

In some of the steel-making districts there will be shutdowns beyond the Tuesday following Christmas, but a good many mills will confine holiday idleness to a minimum so as not to delay shipments.

While none of the mills has a large backlog, nearly all have orders that must be rushed through and it is only natural that mills should want to make shipment of orders placed for January delivery, so as not to encumber inventories, as early in the month as possible.

Pig Iron—Nearly all business from automotive foundries is for one or two carloads. Prices are nominally unchanged, but the general tone of the market is soft.

Aluminum—Quiet and unchanged.

Copper—There has been a moderate amount of covering by domestic consumers this week, sales being made at 5c, delivered Connecticut Valley, for first quarter and 5 1/8c for second quarter positions.

Tin—Quiet. The week's opening price for prompt Straits was 22.85c.

Lead—Dull and unchanged.

Zinc—Quiet and unchanged.

New Hornet Engine Receives Approval

EAST HARTFORD, CONN., Dec. 22—Approved-type certificate No. 92 has been delivered by the Department of Commerce to the Pratt & Whitney Aircraft Co. for its Series T1C Hornet engine. The rating, accorded by the Department, is 700 hp. at 2000 r.p.m. at sea level, while the manufacturer's rating is 650 hp. at the same speed.

The T1C Hornet is a development of the C Hornet, a standard Pratt & Whitney engine of 1690 cu. in. displacement, which has been in production for about a year and a half and has a rating of 600 hp. Only minor modifications were made in the design, the results of experience with the Series C.

The "bare" weight of the new Hornet is 840 lb., and this is said to make its specific weight (1.20 lb. per hp.) less than that of any other radial air-cooled engine in the world. Standard equipment of the engine includes the recently developed control mechanism for Hamilton standard hydro-adjustable propellers, which has been built into the engine nose section; the Pratt & Whitney combination hot-spot and oil-temperature regulator, inter-cylinder deflectors, two Scintilla magnetos, a Stromberg carburetor, a generator drive, propeller-hub attaching parts, a single tachometer drive, a single auxiliary vacuum-pump drive, and an oil pump. Fully equipped the TIC Hornet weighs 870 lb.

The cylinder-head design has been improved by increasing the number of cooling fins on it, adding to the heat-radiating capacity and to the strength. The engine was designed to meet the requirements of designers and operators of high-performance commercial transport aircraft.

Its chief specifications are as follows: Bore, 6⅛ in.; stroke, 6⅜ in.; compression ratio, 6:1; blower-gear ratio, 10:1; fuel consumption, 0.55 lb. per brake horse power per hour under full throttle at rated speed; fuel specification, 87 octane number; oil consumption, 0.035 lb. max. per hp.-hr. at rated speed; over-all dimensions, 55 7/16 in. diameter by 45 21/32 in. length.

Gutta Percha, Ltd., Has New Truck Tire

TORONTO, Dec. 20—C. N. Larsen, sales manager of Gutta Percha & Rubber, Ltd., announces introduction of a new cord fabric tire for bus and trucks.

A.P.I. Forms "Users" Group

NEW YORK, Dec. 20—Activities to protect petroleum products users from unfair legislation and excessive taxation have been announced by the American Petroleum Industries Committee after a series of conferences held in the offices of the American Petroleum Institute here.

Diamond T Has Best November

CHICAGO, Dec. 19—Diamond T Motor Car Co. November truck sales showed a gain of more than 30 per cent over the corresponding month in 1931.

More trucks were sold this November than in any previous November in the 25-year history of the company.

Export sales during the month showed a corresponding increase.

L-O-F Safety Glass Production is Up

TOLEDO, Dec. 19—Libbey-Owens-Ford Glass Co. is now operating its laminated plant on full night and day shifts to care for automotive demand for safety glass.

Eaton Production Up

CLEVELAND, Dec. 19—Eaton Mfg. Co. bumper production was greater for November than for any month since April, 1931.

Eaton is now producing bumper equipment for more than one-third of all motor car manufacturers.

U. S. Registrations Show 6.2% Drop For Year; May Reach 24,356,541 Units

PHILADELPHIA, Dec. 22—Total motor vehicle registrations in the United States will have reached 24,356,541 cars and trucks by Jan. 1, 1933, it is estimated by the statistical department of the Chilton Co., publishers of *Automotive Industries*. These returns include state-owned and official cars and trucks.

This represents a decrease of 6.2 per cent, as compared with the figure for the previous year.

Washington was the only state in the union to show a gain. Here it is expected that an increase of 5.6 will be shown when final, official figures are published. Montana shows the largest decrease, with a drop of 15.2 per cent, as compared with the year before.

The following table will be brought up to date in the annual statistical issue of *Automotive Industries*, Feb. 25, 1933.

MOTOR VEHICLE REGISTRATIONS

(As of Jan. 1, 1932 and 1933)

State	Passenger Cars		Total Motor Vehicles		Per Cent Change
	1932	1933	1932	1933	
Alabama	213,626	195,173	247,521	227,400	—8.0
Arizona	92,939	86,433	105,572	98,183	—6.5
Arkansas	165,417	148,900	187,417	168,700	—10.0
California	1,971,170	1,904,348	2,076,383	2,011,202	—3.1
Colorado	276,376	254,500	308,458	283,400	—8.1
Connecticut	302,316	290,766	356,243	345,016	—3.1
Delaware	45,642	43,538	55,633	52,994	—4.6
Dist. of Columbia	169,907	164,810	190,786	184,025	—3.0
Florida	273,927	252,000	324,746	290,183	—10.5
Georgia	274,576	243,140	320,312	284,540	—11.1
Idaho	97,398	87,658	113,061	101,758	—10.1
Illinois	1,411,261	1,312,736	1,612,770	1,502,736	—6.8
Indiana	737,254	674,000	867,478	794,877	—8.5
Iowa	671,830	607,626	752,882	682,509	—9.2
Kansas	481,742	438,000	562,226	510,000	—9.2
Kentucky	292,234	265,108	329,309	297,719	—9.8
Louisiana	215,117	193,119	262,900	234,619	—10.6
Maine	151,920	144,314	187,746	178,324	—5.1
Maryland	288,485	286,431	325,189	321,307	—1.1
Massachusetts	732,027	707,963	849,190	818,769	—3.2
Michigan	1,078,345	1,001,236	1,230,980	1,136,065	—7.6
Minnesota	613,120	582,450	723,421	686,072	—5.1
Mississippi	152,929	137,636	183,650	165,285	—10.0
Missouri	657,202	603,164	753,202	696,164	—7.6
Montana	104,547	88,500	128,584	109,000	—15.2
Nebraska	357,706	316,571	417,769	368,223	—11.8
Nevada	25,402	25,281	32,712	32,063	—2.0
New Hampshire	93,068	89,500	111,986	106,500	—4.8
New Jersey	731,621	729,835	872,119	869,311	—0.4
New Mexico	65,441	61,944	81,325	76,862	—5.5
New York	1,928,701	1,912,392	2,323,041	2,277,363	—2.0
North Carolina	378,292	340,000	432,935	390,900	—9.5
North Dakota	144,705	127,340	171,293	150,737	—12.2
Ohio	1,531,000	1,427,980	1,722,929	1,594,700	—7.2
Oklahoma	428,140	385,326	482,725	434,453	—10.0
Oregon	244,509	237,146	269,681	262,228	—2.7
Pennsylvania	1,515,548	1,443,469	1,743,083	1,663,551	—4.5
Rhode Island	118,155	114,500	138,801	134,131	—3.2
South Carolina	182,239	170,000	206,963	192,000	—7.1
South Dakota	169,911	149,500	193,820	170,550	—12.2
Tennessee	318,544	267,700	353,640	301,700	—14.6
Texas	1,084,624	1,002,000	1,296,837	1,188,720	—8.3
Utah	91,381	82,500	108,958	98,800	—9.4
Vermont	75,282	68,970	83,877	77,337	—7.8
Virginia	323,170	301,500	382,954	354,975	—7.5
Washington	366,912	382,741	428,708	452,320	+5.6
West Virginia	217,874	193,150	257,560	227,300	—8.0
Wisconsin	641,059	588,539	759,814	700,670	—7.7
Wyoming	51,283	46,200	62,200	55,800	—10.2
TOTAL	22,555,874	21,177,633	25,982,389	24,356,541	—6.2

Dominion Transport Confab Due January

Automotive Competition With Rails to be Main Topic of All-Canadian Conference

TORONTO, Dec. 20—An All-Canadian conference to discuss the transportation situation in the Dominion will be held in January under the auspices of the Federal Government to seek standardized regulations of rates, services, working conditions, wages, licenses and taxation of public commercial carriers using the highways.

The subject will be studied in relation to the transcontinental railway systems of the Dominion, both of which have been causing some financial concern because of general economic conditions and the competition of motor vehicles.

Government control of highway transport rates is being urged in some quarters, this to be similar to the authority maintained by the Dominion Board of Railway Commissioners in the case of the railways. This is regarded as a controversial point, however, as the Ontario Provincial Government has already placed itself on record as opposed to the establishment of rate schedules by the Government for highway transports and passenger coaches.

This view is taken on the ground that it will lead to a demand from other industries and trades for Government control of prices and the Province does not want to have anything to do with price maintenance.

This is regarded as an artificial system and one that tends to destroy competition.

It is expected, however, that the Conference will adopt a plan for compulsory insurance by all transport operators and will recommend certain improvements in transport accounting methods with provision for statistical returns to the respective Provincial Governments at stated intervals.

$5 White Motor Cash Distribution

CLEVELAND, Dec. 21—White Motor Co. has declared a cash distribution of $5 a share on the capital stock pursuant to terms of the merger agreement with Studebaker Corp. now in effect. The distribution is payable Dec. 23 to stock of record Dec. 20.

Chevrolet Rehires 2000 at Tarrytown Plant

TARRYTOWN, N. Y., Dec. 20—This city, now the largest automobile-manufacturing center in the East, is celebrating the return of good times. More than 2000 men have been called back to work a month ahead of time by the Chevrolet Motor and Fisher Body Co.

It is expected that the full force of 3000 workers will be employed within a month's time.

The company will take on none but former employees at the plant here.

Guide Lamp Executives Promoted by G. M.

F. S. Kimmerling, general manager of the Guide Lamp Corp., Anderson, Ind., a General Motors unit, has been transferred to Detroit as assistant to C. E. Wilson, vice-president of the General Motors Corp.

Frank H. Prescott, chief engineer of the Delco-Remy Corp., had been named general manager of the Guide plant to succeed Mr. Kimmerling. H. D. Dawson was named chief engineer of Delco-Remy to succeed Mr. Prescott.

S.A.E. Dinner Date Changed to Jan. 11

NEW YORK, Dec. 22—The annual Society of Automotive Engineers banquet will be held 6:30 p.m., Wednesday, Jan. 11, at Hotel Pennsylvania, New York, instead of on Jan. 12, as heretofore planned.

Speakers will be Roy Faulkner, president, Pierce-Arrow Sales Corp., and Bancroft Gerhardi, vice president, American Telephone & Telegraph Co.

Reinald Werrenrath, operatic and concert baritone, will sing and Rube Goldberg, cartoonist, will talk.

Charles F. Kettering, vice president, General Motors Corp., will be toastmaster, and Adolf Gelpke, assistant chief engineer, Autocar Co., Ardmore, Pa., is chairman of the annual dinner committee.

New York Show Week Events

	THURSDAY, Jan. 5	
8 P.M.	Stutz Dealer Meeting (There will be a meeting at Stutz headquarters every day during the Show from 4 to 5 P.M.)	16 W. 61st Street
	FRIDAY, Jan. 6	
	Packard Pre-Show Meeting and Luncheon	Hotel Astor
	Packard Dealer Luncheon	Hotel Roosevelt
	SUNDAY, Jan. 8	
11 A.M.	Stutz Export Organization	Hotel Commodore
	MONDAY, Jan. 9	
10 A.M.-5 P.M.	National Auto Dealers Association Meeting	Hotel Commodore
12 Noon	American Automobile Association Meetings (Contest Board Safety Committee, Management and Personnel Training Committee and Membership and Sales Promotion Committee)	Hotel New Yorker
12 Noon	Buick-Olds-Pontiac Dealer Luncheon	Hotel Commodore
	Marmon Dealer Luncheon	Hotel Commodore
12.30 P.M.	International Day Luncheon	NACC offices
2.00 P.M.	International Day Conference	NACC offices
6.30 P.M.	Rubber Manufacturers Association Dinner	Hotel New Yorker
7.00 P.M.	Combined Dealer Banquet of Chrysler, De Soto, Dodge and Plymouth organizations	71st Regiment Armory, 34th & Park Ave.
	TUESDAY, Jan. 10	
12 Noon	Willys-Overland Dealer Luncheon	Hotel Commodore
	Auburn Dealer Luncheon	Hotel Commodore
	Reo Dealer Luncheon	Hotel Biltmore
	American Automobile Association National Board of Directors' Meeting	Hotel New Yorker
	Marmon Dealer Luncheon	Hotel Commodore
6.30 P.M.	National Automobile Chamber of Commerce Banquet	Hotel Commodore
	WEDNESDAY, Jan. 11	
	Cadillac Dealer Luncheon	Waldorf-Astoria
	Marmon Dealer Luncheon	Hotel Commodore
6.30 P.M.	Society of Automotive Engineers Annual Dinner	Hotel Pennsylvania
	THURSDAY, Jan. 12	
	Marmon Dealer Luncheon	Hotel Commodore
	FRIDAY, Jan. 13	
	Marmon Dealer Luncheon	Hotel Commodore

Chicago Show Week Events

	MONDAY, Jan. 30	
12.30 P.M.	Buick-Olds-Pontiac Dealer Luncheon	Palmer House
7.00 P.M.	Chrysler, De Soto, Dodge and Plymouth Dealer Dinner	Naval Armory
	TUESDAY, Jan. 31	
12.30 P.M.	Auburn Automobile Dealer Luncheon	Stevens Hotel

Indiana Truck Moved To White Motor Plant

One of Oldest Concerns Has Large Acceptance in Public Works Department Fleets

CLEVELAND, OHIO, Dec. 20—Manufacturing, engineering and sales departments of the Indiana Motors Corp. will be moved here from Marion, Ind., immediately, according to A. G. Bean, president, White Motor Co.

This brings to the White factory the manufacture and assembly of three of the oldest truck companies in the industry, White, Pierce-Arrow and Indiana. The removal of the Pierce-Arrow truck lines from Buffalo, N. Y., to Cleveland is now practically completed and the work of transferring the Indiana lines will get under way at once.

Studebaker trucks will continue to be built at South Bend and Rockne commercial cars at Detroit.

Indiana, which was purchased by the White Motor Co. several months before the merger with the Studebaker Corp., is one of the oldest companies in the business. It was the outgrowth of a successful industry founded in 1898, the first Indiana truck having been built in 1909.

In the beginning the Indiana company followed an interesting merchandising policy. Inquiries from direct mail and publication advertising were turned over to one of the company's staff of salesmen at the factory. From these the salesmen would build a "route" through the countryside and make the rounds. As soon as the truck found a buyer the salesman returned to the factory to repeat the process.

Today the Indiana truck is being used by a number of the country's leading commercial accounts and is widely known in the public works market.

Canadian Vehicle Imports Down; Exports Show Gain

TORONTO, Dec. 20—Total imports of vehicles and parts into Canada for the year ending Oct. 31 were valued at $13,919,249, as compared with $24,856,463 for the preceding 12 months.

For October the valuation of imports was $537,267, as compared with $638,985 for October, 1931. Of the total for last October, imports from the United States accounted for $514,507 and those from the United Kingdom were valued at $21,507.

While Canada imported 49 motor vehicles in October, the Dominion exported 2462 cars and trucks during the month and the exports for October one year ago totaled only 712.

Canadian exports have been in excess of 1931 shipments since June with October being the banner month in this respect.

This is in keeping with the record of production in Canadian factories, the total output for last October being 2923 units, compared with 1440 units in the same month of 1931.

The October increase was in passenger cars of which those made for export totaled 2232.

M.E.W.A. Increases Membership in 1932

NEW YORK, Dec. 20 — Motor and Equipment Wholesalers Association announces the election of 15 new members, bringing the net membership increase of the association for the year up to 72, believed to be a new record in trade association membership growth, especially in a depression year.

This increase, said B. W. Ruark, general manager, is conclusive proof of widespread jobber endorsement of the association and its capacity to serve the automotive jobbing industry.

Carolina Tax Down

COLUMBIA, S. C., Dec. 19—Gasoline tax collections in South Carolina for November totaled $544,177, as compared with $643,109 for November, 1931.

M.E.M.A. to Urge Anti-Trust Changes

NEW YORK, Dec. 19 — Changes in anti-trust laws to make possible voluntary agreements between sellers without violating the principles upon which these laws are founded will be urged upon Congress by directors of the Motor and Equipment Manufacturers Association, representing producers of parts, accessories, tools, equipment and supplies for the motor industry.

The group requests that an "Emergency Industries Preservation Act" providing necessary relief temporarily under the supervision of the Federal Trade Commission be passed pending the determination of the proper form of permanent legislation.

Evinrude Will Build Wood-Working Unit

MILWAUKEE, Dec. 19—To further diversify its line of products to correct seasonal and economic variations in considerable measure, the Outboard Motors Corp. here is placing in production a complete wood-working unit designed by Ole Evinrude, president.

It is designed for factory maintenance, pattern shops, carpenters, etc.

+ + CALENDAR OF COMING EVENTS + +

FOREIGN SHOWS

Canadian National Motor Show, Toronto ..... Jan. 14-21
Berlin International ..... Feb. 12-22

CONVENTIONS

Rubber Mfr.'s Assoc., New York City, Annual Meeting ..... Jan. 9
Metropolitan Section, S. A. E., Annual Automobile Show Dinner, New York ..... Jan. 9
Annual Society of Automotive Engineers Dinner—New York .. Jan. 11
Highway & Building Congress, Detroit ..... Jan. 16-20
American Road Builders' Annual, Detroit ..... Jan. 16-20
Steel Founders Soc. of America—Annual Meeting—Detroit ... Jan. 16-21
Annual Society of Automotive Engineers Meeting — Detroit Jan. 23-26
American Soc. for Testing Materials (Annual Meeting) ... June 26-30

SHOWS

National Automobile Show, New York ..... Jan. 7-14
Pacific Automobile Show, San Francisco ..... Jan. 7-14
Los Angeles, Calif., Automobile Show ..... Jan. 7-15
St. Louis, Mo., Automobile Show. Jan. 8-14
Buffalo, N. Y., Automobile Show Jan. 14-21
Canadian National Motor Show, Toronto ..... Jan. 14-21
Cleveland, Ohio, Automobile Show Jan. 14-21
Milwaukee, Wis., Automobile Show Jan. 14-21
Newark, N. J., Automobile Show Jan. 14-21
Cincinnati, Ohio, Automobile Show ..... Jan. 15-21
Brooklyn, N. Y., Automobile Show Jan. 16-21
Philadelphia, Pa., Automobile Show ..... Jan. 16-21
Baltimore, Md., Automobile Show Jan. 21-28
Detroit, Mich., Automobile Show, Jan. 21-28
Boston, Mass., Automobile Show Jan. 21-28
Hartford, Conn., Automobile Show Jan. 21-28
Pittsburgh, Pa., Automobile Show Jan. 23-28
Harrisburg, Penna., Automobile Show ..... Jan. 25-28
Rochester, N. Y., Automobile Show ..... Jan. 23-28
Portland, Me., Automobile Show Jan. 28-Feb. 4
Washington, D. C., Automobile Show ..... Jan. 28-Feb. 5
National Automobile Show, Chicago ..... Jan. 28-Feb. 4
Springfield, Mass., Automobile Show ..... Jan. 30-Feb. 4
Lancaster, Pa., Automobile Show Feb. 1-4
Indianapolis, Ind., Automobile Show ..... Feb. 4-11
Denver, Colo., Automobile Show Feb. 6-11
Springfield, Ill., Automobile Show Feb. 9-11
Kansas City Automobile Show .. Feb. 11-18
Toledo, Ohio, Automobile Show . Feb. 11-18
Rapid City, S. D., Automobile Show Feb. 14-18
Peoria, Ill., Automobile Show ... Feb. 15-19
Wichita, Kans., Automobile Show Feb. 21-24
Holyoke, Mass., Automobile Show ..... Feb. 22-25
Evansville, Ind., Automobile Show Feb. 24-26
Des Moines, Iowa, Automobile Show ..... Feb. 27-Mar. 4
Seattle, Wash., Automobile Show Feb. 26-Mar. 4

Car Makers Mobilize for 1933

(Continued from page 791)

the past this control generally has been "manual," the supply of heat being adjustable either from the dash or at the manifold, in which latter case the adjustment was made only to compensate for seasonal changes. It is obvious that neither of these methods can give anything like uniform temperature of the entering mixture. While this ideal probably is not completely attained by the new system of thermostatic heat control, it is certainly approached to a considerable degree, and the idea has met with instant favor, as witnessed by the large number of cars for which this feature is specified. Briefly stated, the inlet manifold is provided with an exhaust jacket and a valve is arranged to pass more or less of the exhaust through the jacket, according to the temperature of the inlet manifold. The valve is controlled by a bimetallic thermostat.

Another feature of the fuel system that is new this year is the variable idle position of the throttle. The idle position, of course, is determined by the stop on the carburetor which limits the closing motion of the throttle valve. If this stop is so adjusted that it assures proper idling when the engine is hot, it will cause the engine to stall when cold. For steady idling while the engine is still cold, the throttle must be kept further open, and what is done now is to provide an auxiliary movable stop for the throttle lever which is automatically withdrawn as the engine temperature rises. The stop is moved by a thermostat—the same instrument that actuates the choke (page 791.)

On a good many cars the fuel-tank capacities have been increased. Among the factors which made this seem desirable we may probably count increased engine power and a consequent increased maximum rate of consumption; unreliability of some of the types of fuel gages, which often compels the driver to guess as to what his supply may be, and a growing tendency to stick to particular grades of fuel which are known to give satisfactory results with the particular engine.

It is now common practice to run the fuel line from the rear tank forward outside of the frame side rail, to a point opposite the fuel pump, to shield it from the heated air from the engine compartment and thus prevent vapor lock. Since nearly all engines are now flexibly mounted, in order to prevent breakage of the fuel line between the side rail and the pump or filter, a flexible tube is used for this connection.

Ignition

Spark timing gets a new concept

Several makers have increased the size of spark coil used by them, to obtain a more powerful spark. The need for this undoubtedly is felt most when trying to start a very cold engine. Owing to the "stiffness" of the engine, a very large starting current is needed, and the draft on the battery pulls down the voltage available at the terminals of the coil primary. The lower the voltage at the primary terminals the lower will be the pressure induced in the secondary, and this just when the highest voltage is required to break down the dielectric resistance of the spark gap, due to the high compression accompanying the low starting speed. Certain makers also report improvements in the breaker arms of ignition units, to better adapt these units to high-speed operation. It appears that an improved commercial alloy for breaker points has been introduced on the market, which will carry the hotter sparks of the larger coils without wearing or burning away too rapidly at the high engine speeds now common. In spark plugs the trend continues toward the 14-mm size, which, because of its lesser tendency to overheat, favors the use of high compression ratios. Nash continues the dual ignition system.

A rather interesting development has taken place with regard to spark timing. Originally the setting of the spark was changed only with a change in engine speed, by means of a centrifugal governor. Research work carried out in recent years has shown, however, that the optimum timing varies with the speed, the load, the character of the fuel used, and the temperature of the engine. When the speed increases the spark setting must be advanced because there is a certain definite time lag between the opening of the breaker points and complete inflammation of the charge, which corresponds to a larger crank angle at high than at low speeds. When the engine is running under light load it will stand a greater advance than when it is fully loaded without detonation, and, of course, a greater advance can be used with a fuel of high anti-knock value than with one of lower rating. Up to the point where detonation begins an increase in spark advance increases power and economy.

It is a rather remarkable illustration of the lengths to which manufacturers of even the lower-priced cars go in the refinement of their powerplants that in the new Chevrolet the spark timing is governed automatically in accordance with engine speed and engine load (by means of a centrifugal governor and a vacuum cylinder communicating with the inlet manifold, respectively), and in addition can be set by hand to compensate for changes in the anti-knock value of the fuel used. No doubt the constant endeavor to go as far as practicable with respect to compression ratio, for the sake, mainly, of increased power, encourages such refinements.

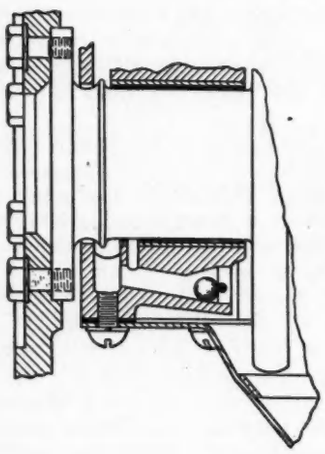
Lubrication

Rifle-drilled connecting rods are among developments

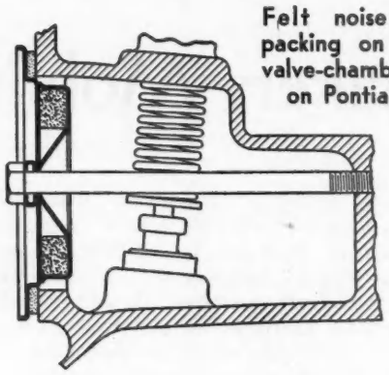
There is nothing strikingly new in engine lubrication systems, though many detail improvements have been made. In a general way, lubricating features of merit that in the past have been confined to a few high-priced cars are gradually making their way into the lower-priced field. Thus an increased number of engines this year have rifle-drilled connecting

rods for pressure lubrication of the piston pins. The practice of drilling a radial hole through the connecting rod head, registering for a certain period of crankshaft revolution with a radial hole in the crankpin, for more effective lubrication of the cylinder walls, particularly while starting from cold, has gained several more adherents. One maker has dropped the oil temperature regulator, the feature that was resorted to in recent years by a number of manufacturers as a safeguard against bearing failure; the explanation in this case is that the adoption of the new thin-walled steel-backed bearing bushing makes any such safeguard unnecessary; but both the Stutz and the Pierce Arrow this year carry oil regulators, in addition to several others which had them last year.

Several of the new engines, including the Plymouth Six and the Willys Four, carry the oil pump outside the crankcase, at the bottom of an inclined shaft, where it cannot freeze up and where it is more accessible for inspection and repair. The use of the floating oil intake, by which oil is taken into the pump from the surface of the supply in the sump, rather than from the deepest point where the sludge accumulates, is extending. Better provisions are being made—and many motorists will agree that there is need for them—against oil leakage from the crankcase. Thus in the new Pontiac eight-cylinder engine the flange on the crankcase pan is corrugated, for greater stiffness and a consequent better oil seal. On the same engine a check valve is provided in the return passage from the oil-slinger groove at the rear engine bearing, to prevent oil escaping through this passage when the car is on a steep incline. This feature is illustrated herewith.



Check valve in oil-return passage from slinger-groove in rear bearing of Pontiac engine



Felt noise-absorbing packing on inside of valve-chamber cover on Pontiac engine

Cooling

Thermostatic control gains favor

Radiator shutters are generally being discarded, probably as a result of the new style in car fronts which calls for barred guards or grilles for the radiator, and a return has been made to thermostatic control of the water circulation. There are, generally speaking, two forms of thermostatic control of the water circulation. The thermostat may either close a valve in the outlet from the cylinder jacket, which is permissible since the centrifugal pump is not a positive pump and stops delivering water when the resistance exceeds a certain value varying with the pump speed; or it may operate a valve in a bypass between the inlet to and the outlet from the radiator. With the former arrangement all circulation is stopped when the engine is cold, whereas with the latter the water circulates through the jacket but not through the radiator when the engine is first started. This latter arrangement is now generally preferred.

A greater number of models this year carry fans with assymetric blades, which operate more quietly than the more conventional type; and in some cases there has been a reduction in fan speed to cut down noise.

There has been a general change in the method of radiator mounting. Formerly radiator shells were bolted to the front cross member of the frame at two points a considerable distance apart, which made them rigid with the frame. This, in conjunction with the tendency to front-end instability and insufficient rigidity of the frame, caused a very pronounced relative motion between the top of the radiator and the body under certain operating conditions. It is now getting to be the practice to mount the radiator shell on the front frame member at a single central point on a cushion, and to brace the upper part of the shell to the cowl, so that while the weight of the radiator is supported by the frame it is tied rigidly to the body and cannot vibrate perceptibly with relation to the latter. The fenders, moreover, are supported and braced in the same way, for the same purpose.

Violent vibration of the radiator in case of tramp and shimmy naturally is quite hard on the radiator core, and a more rigid construction of cores, or at least one more resistant to damage by vibration, is called for. What seems to be a new idea in the way of protecting radiator cores against damage due to vibration is found in this year's Pierce-Arrow models. These have tube-and-fin cores, and at the sides of the core the tubes are replaced by solid bars, which naturally take most of the stresses.

Packard apparently has added considerably to the capacities of its cooling systems this year, for the fans are surrounded by shrouds and are driven by double V belts, and the radiator cores are made deeper and have greater cooling area. On the Willys Four, the use of a relatively small engine in conjunction with a wide car front has led to the adoption of a radiator core of square frontal area, which possesses the advantage that a relatively large proportion of its surface is swept by the fan.

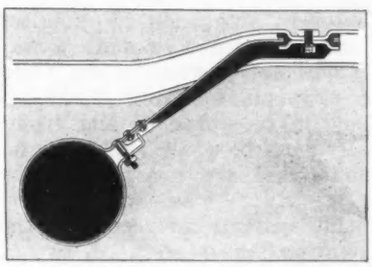
On the Stutz the hood doors are controlled by thermostats, one for the doors on each side. This gives an effect similar to that of thermostatically-controlled radiator shutters, the only difference be-

ing that practically all of the air passing through the engine compartment enters through the radiator, while only a part leaves through the hood doors.

Mufflers

Straight-through mufflers on many models

Mufflers have had considerable attention bestowed upon them during the past year. The "straight-through" type has gained considerably in popularity, but is evidently still in a state of development, for while one manufacturer has done away entirely with sound-absorbing material in the chamber surrounding the central pipe, another uses two different kinds of such material. Double-unit mufflers are common and sizes of mufflers in many cases have been increased, to reduce the back pressure. The muffler problem naturally is becoming more difficult with the constant increase in power, and to effectively silence the exhaust from an engine of perhaps 150



Spring support of muffler on Chevrolet car

hp. with the small mufflers used for the purpose is quite an achievement. In the Buick the change to the "straight-through" type muffler is said to have resulted in a reduction in back pressure from 5 to 1½ lb. per sq. in.

In the Pierce-Arrow both the exhaust pipe and the outside of the muffler are lagged with insulating material, the exhaust pipe chiefly to reduce the radiation of heat in the engine space; the muffler, of course, more with a view to absorbing noise.

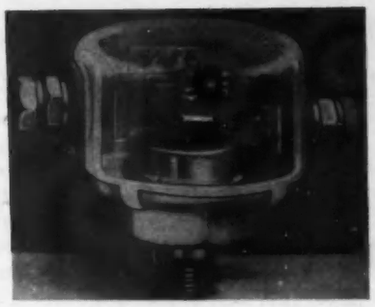
On all cars in which the powerplants are so mounted as to have considerable freedom of oscillatory motion, the mufflers must be so suspended that they can participate in the motions of the powerplant, and the way in which this is accomplished in the Chevrolet is shown in one of the illustrations herewith.

Starting

Important advances made in new models

It is in connection with engine starting that some of the most important advances in powerplant engineering have taken place during the past year. The subject is so new that the vocabulary of the art is as yet in a very undeveloped state.

First came the so-called Startix, by which closing of the ignition switch also—through a relay—closes the starter switch and effects the engagement of the starter gear. It is understood that the introduction of this device during the past year was the direct result of the greater chance of engines stalling on



Phantom view of automatic switch protecting starter on Studebaker cars in the event of a back-kick (reverse motion) of the engine

cars with a free-wheeling unit, in which the motion of the car does not keep the engine rotating. Not only does this device simplify the starting operation, but it restarts the engine immediately if stalled, thus possessing a certain value from the safety standpoint.

A starter of this type, which is energized by the closing of the ignition switch, is used on Studebaker and Pierce-Arrow cars. If turning of the ignition switch fails to set the starter in motion, the starter swich can be closed manually by means of a button on the housing. On Studebaker cars there has been introduced also a safety device which protects the starter in case the engine accidentally starts up backward. Suppose, for instance, that a spark occurs in a cylinder while the piston in it is still a considerable distance from the end of the compression stroke. This may overpower the starter and the engine start to turn backward. During the next up-stroke the inlet valve will be open and the burnt gases therefore will be discharged into the inlet manifold. The resulting increase in pressure in the manifold raises a plunger which in turn closes the battery circuit through a bimetallic strip. This strip carries contacts which lead current into the starting relay, but when the strip is grounded by the plunger it takes a much heavier current, which causes it to heat and curl up and so break the relay contact. This in turn causes the starter circuit to open. A phantom view of this automatic cut-out switch is shown herewith.

On various lines of the Chrysler Corporation and on Chevrolet cars starting of the engine is effected by depressing the accelerator pedal. Chrysler, I understand, has applied the term "coincidental starting" to this method.

When the engine is at rest the starter switch is interlocked with the accelerator pedal, and the first part of the downward motion of this pedal closes the starter switch and engages the starter gear. As soon as the engine begins to turn over, a vacuum is created in the inlet manifold, which is communicated to a small power cylinder that then disengages the starter mechanism from the accelerator pedal, so that during the remainder of the pedal range only the throttle is affected.

Engine Mounting

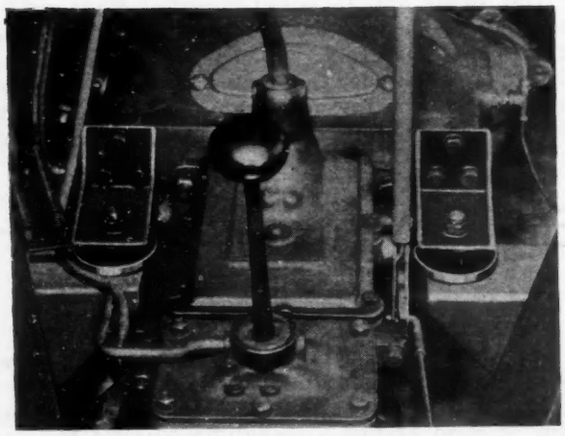
Departure from old type of suspension

This year there has been a pronounced move toward types of engine mounting that give the engine or the whole powerplant considerable freedom of oscillatory motion around a longitudinal axis. Mounting of the engine on rubber cushions or suspending it on vulcanized rubber hangers is now a practically universal practice. In the original rubber mountings

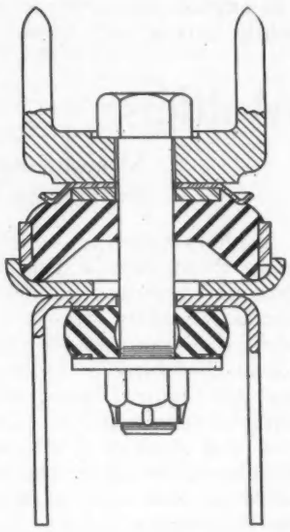
the rubber was used in the form of bushings and washers at the bolts holding the supporting arms of the engine to the side rails or to mounting brackets on these rails. This served to absorb vibrations of very high frequency originating in the engine and prevented their transmission to the frame and body. Since that time Chrysler has introduced his familiar "floating power" type of mounting which is now used not only on the various Chrysler-Corporation lines but also on the new Willys models. Other makers have increased the angular freedom of the powerplant on the frame by increasing the yield of the rubber cushions (by changes in their size, shape and composition), by bringing the supporting points closer to the axis of the engine (by mounting the engine on frame cross members rather than on the side rail), or by using two main supports, located centrally at the front and rear, which take by far the greater part of the weight, and one or more auxiliary supports at the sides of the engine, which are highly cushioned and serve chiefly to resist the torque on the engine structure.

A good example of the more flexible type of rubber cushion now used is the "pneumatic" cushion which is found on a good many cars this year. A sectional view of this is shown herewith. The virtue of types of mounting allowing considerable angular freedom that is usually emphasized most is that they absorb inequalities in engine torque reaction and prevent these from being transmitted to the frame and body. The engineering department of the Graham-Paige Company bases its preference for such a mounting on the fact that it reduces the natural rate of vibration of the powerplant around its longitudinal axis of gyration and tends to prevent synchronism between this rate and the rate of impulses received.

The adoption of angularly flexible engine mountings has necessitated a redesign of all the control connections, as well as of the fuel connection to the carburetor, to which latter reference has been made already. It was formerly common practice to mount both the clutch pedal and the brake pedal directly on the powerplant, but when the powerplant is capable of relatively free oscillation, this is evidently impracticable. At present the pedals are either supported by brackets mounted rigidly on the frame or else on shafts carried in spherical or similar bearings on the frame and the powerplant respectively.



Rear support of powerplant on Auburn car, illustrating the new practice of placing the supports close to the axis



Sectional view of the "pneumatic" rubber mounting used on many engines this year

Gear-shift and brake levers also must be mounted on a frame member or else guided in such a way that their upper ends will not partake in the oscillatory motion of the powerplant. Connections between the control members mounted on the frame and the engine naturally must be of such a character that the functions controlled are not affected by engine oscillation.

With the new mounting systems referred to in the foregoing, if three mounting points are used, two of these are usually at the front, rather than at the rear, as formerly. In at least two cars the engine is fastened rigidly to a cross channel or bearer in front, which comes off with it when the engine is taken from the chassis, this bearer being supported at its ends on the frame side rails on or between rubber cushions.

In the Chrysler "floating-power" mounting, at least in some of its applications, the torsion spring has been eliminated and the torque is now taken on rubber blocks at the bell-housing.

Clutches

Automatic clutch control gains in popularity

Changes in clutch practice have to do mainly with automatic control as made available to the industry through the Bragg-Kliesrath Division of the Bendix corporation last year. It appears that in its original form this method of clutch control sometimes gave trouble through causing the clutch to take hold too suddenly. Evidently, if the accelerator is depressed suddenly from the idling position, the vacuum in the inlet manifold, which holds the clutch in the disengaged position, is relieved very quickly, which has the same effect as removing the foot from the clutch pedal too rapidly, the car then starting with a jerk. This has now been remedied by the provision of an additional member, a pendulum-type cushion valve, which controls the air inlet to the power cylinder. Under normal conditions the pendulum occupies a vertical position and the valve is then open, allowing atmospheric air to be drawn into one end of the cylinder as the piston therein is drawn toward the other end by the inlet vacuum. But if the car tends

to start with a jerk, the pendulum instantly swings around its pivot and closes the air valve, thereby greatly reducing the speed with which the clutch engagement is completed.

One question that suggests itself immediately is with regard to the effect of grades on the operation of the clutch, as the pendulum naturally will swing around its pivot when the car rises in front on starting on an up-grade. The manufacturer explains that this effect has been fully considered, and that the slight angular motion of the pendulum on even the steepest grades found on traveled highways, while it moves the valve slightly, will not close it.

Automatic clutch control will be used this year as standard equipment on all Chrysler lines, on all Buick models and on some Hudson, Essex and Stutz models, and will be optional on Cadillac, La Salle, Hupmobile and Oldsmobile models. Packard, who offered the feature as standard equipment last year, makes it optional this year.

On some cars, including the Packards and Oldsmobile, foot operation of the clutch has been rendered easier by the use of anti-friction bearings on the pedal shaft, etc., and on the Packard also by an increase in the mechanical advantage of the clutch-operating mechanism.

Transmissions

Helical gears in more general use

Further steps have been taken to silence transmissions. Heretofore it has been customary to use helical gears only for the first-reduction and the intermediate-speed pairs, leaving the gears for the low speed and reverse straight spur gears. This practice was departed from last year by Cadillac and this year there are a number of additional cars in which all of the gears in the transmission are of the helical type, including most of the Chrysler lines. Usually helical change gears remain in mesh continuously and are engaged and disengaged by means of dog clutches; this has the disadvantage that the length of the gear box is increased and the size of the shafts must be increased if the rigidity is to remain the same; in the new Chrysler transmissions of the all-helical type the gear for low forward speed and reverse is mounted on helical splines, with the same helix angle as the gear teeth, which permits of shifting into and out of mesh the same as with spur gears.

Closely connected with the subject of transmissions is that of free wheeling. While most of the mannfacturers who offered this feature last year have continued it, two have given it up. There has been no shift from one type of free-wheeling device to the other, the two makers who used the coil-clutch type of unit last year—Auburn and Chevrolet—continuing it in a simplified form. In several cars the free-wheeling unit is now enclosed within the transmission housing at the rear end, instead of being bolted to the rear of this housing. This makes for simplicity and compactness, and probably is most desirable where another device, such as a brake or brake booster, must be mounted on the rear of the transmission.

In one new transmission (Dodge) the countershaft cluster is mounted on needle bearings.

Axles and Universal Joints

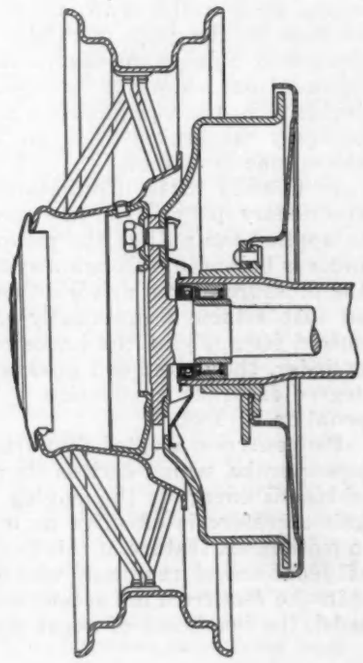
Needle bearing widely used in universals

It is in the universal-joint field that the needle bearing has met with striking success. There are probably no other bearings in the entire car that are so heavily loaded as those in conventional universal joints, and hardened steel trunnions and bushings have been commonly used, but partly on account of the severe loads and partly because of the difficulty of efficiently lubricating rapidly revolving bearings, failures appear to have been unpleasantly frequent.

On the Plymouth, the universal joint at the forward end, which is of the needle-bearing type, is provided with trunnions sliding in a "pot-type" outer member, which eliminates the need for a sliding splined fitting.

As regards rear axles, the adoption by Pierce-Arrow of worm drive for its eight-cylinder models is worthy of note. Worm-drive axles share with the hypoid gear-driven type the advantage of permitting a lower floor level without interference, and Pierce-Arrow seems to prefer the worm-drive axle as being lighter and giving greater latitude with respect to lowness of floorboards. While on this subject of clearance between axle and body it may be mentioned that in one car the rear seat pan is discontinued over the rear-axle center housing and replaced by a rubber diaphragm, so that when the clearance is fully taken up the rear axle, instead of striking the rigid seat pan, contacts with the rubber.

Several makers have adopted the type of axle first introduced on the Rockne last year in which the driving gear is assembled in the center housing instead of in a gear carrier bolted to that housing. Adjustment of the gears for correct mesh is usually by shims. In several of the new rear axles the cover plates for the center housings are welded in place, which adds to the rigidity of the axle as a whole and slightly reduces weight. On Chevrolet and Pontiac cars (see cut) the axle shafts are forged with large



Axle shaft provided with integral flange to which wire wheel is bolted (Pontiac)

flanges at the ends, to which the wheels are bolted, thus dispensing with the need for hubs keyed to the shafts. With this arrangement the end thrust is taken care of at the center of the axle.

· Packard continues to use the hypoid-gear drive axle, and this type of drive has been newly adopted for the Hupmobile Six. One difficulty that has been experienced with hypoid-gear drives is that these gears call for the use of "extreme-pressure" lubricants, which latter, as a rule, are not beneficial to the ball bearings in which the gears are mounted. In the Packard this is taken care of by the provision of felt filter units designed to keep out those elements of the e.p. lubricants that are injurious to the bearings.

Bakelite thrust washers are used in the rear-axle assembly of the Essex Terraplane. This car upon its appearance last Summer set a new mark with respect to acceleration; high acceleration naturally involves high rear-axle torque in proportion to car weight, and the increased stresses on the rear axle and its driving members probably led to the provision of these thrust washers, which are quite uncommon in low-priced cars. Moreover, it is announced that in the revised model the rear axle of the Terraplane has been strengthened 35 per cent.

On two makes of car, Plymouth and Dodge, tubular front axles have been adopted this year, while one maker (Willys) who used them last year has reverted to the I-section axle center. There have been some changes in the caster and knuckle-pin inclination of front axles this year to better meet the requirements of low-pressure tires.

Brakes

Adoption of power braking gains

Power braking has made a great deal of progress this year in the passenger-car field. B-K booster brakes will be standard equipment on no less than nine makes, on one or all models, including Studebaker, Hudson, Packard, Lincoln, Auburn, Cadillac, La Salle, Duesenberg and Marmon; and optional equipment on a number of others. The B-K power brake, as is well known, derives its power from the vacuum in the inlet manifold, and therefore is effective as long as the engine is operating. In some installations, however, a special vacuum tank is included in the equipment, which makes it possible to apply the brakes by means of power even when the engine is at rest.

In most of these installations power units of the reactionary puller type are used. When the brake is applied the pull of the piston in the vacuum cylinder is balanced, through a system of levers, against the pressure of the driver's foot on the brake pedal, so that although practically all of the power required for applying the brake comes from the power cylinder, the driver can always accurately gage the degree of brake application by the reaction of the pedal on his foot.

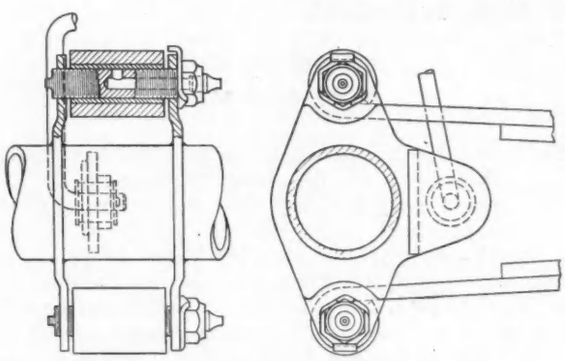
Pierce-Arrow adopted Stewart-Warner's mechanical power brake, which derives its power from the store of kinetic energy in the moving vehicle. This power unit therefore is effective as long as the vehicle is in motion. A feature of this brake is the small range of pedal travel required, which makes it easier to shift the foot from the accelerator pedal to the brake pedal, the two being of about equal height above the toeboard when released. (See page 800, this issue.)

Composite brake drums with cast-iron friction surfaces have come into wide use. In some additional cars, notably the Buicks, application of the brakes by foot has been made easier by providing the brake rigging with anti-friction bearings.

Steering

Steering is still conventional

There does not appear to be anything strikingly new in steering gears, but several features designed to add to the comfort of the driver or to promote front-end stability have met with wider acceptance. Three-spoked steering wheels are almost universal, and adjustability of the column for rake is quite common. Kick shackles have been introduced on several additional cars this year. Needle bearings have made their way also into steering gears, being used probably not so much to reduce the steering effort required as to retard the development of slack. A type of steering connector in which the stud is held in a rubber bushing has been introduced (by the Columbia Parts Company, I understand) and is found on several 1933 models. On the Dodge and Plymouth the steering drag link extends parallel with the front axle instead of lengthwise of the car. This arrangement would seem to be of advantage particularly in smaller cars, where the drag link, if it extends across the car can be made much longer than if it extends fore and aft, and the effects of angularity are correspondingly reduced.



Attachment of double cantilever springs to rear axle housing in Continental Four

On the Hupp Six the steering gear is reversed from the usual position, in that the wheel or driven member is above the worm, but this seems to be a matter of convenience in mounting only.

Wheels and Tires

New metal wheels make appearance

Several new types of wheel, made from sheet metal chiefly by press work, have made their appearance. Buick, Oldsmobile and Willys models have such wheels. The Buick wheels have spokes of semi-circular cross section, the open side of which is closed by a backing plate. In the Oldsmobile wheels a pressed-steel spoke spider has the ends of its spokes

riveted to the combined felloe and rim, while the Willys wheels, which are of Kelsey-Hayes make, are described as composed of a stamped steel disk giving the appearance of spokes.

An increase in tire sizes and a corresponding decrease in base diameters of wheels has been quite general. While no maker has adopted tires designed for the low inflation pressure of 10 lb. or thereabouts, spoken of when the low-pressure tire movement started, Dodge furnishes 16/6.00-in. wheels designed for 25 lb. inflation pressure as regular equipment, and De Soto offers 15/7.00-in. air wheels in its Custom line. Graham continues to offer air-wheel equipment and Packard has reduced its recommended inflation pressures to 33 and 36 lb., its tire sizes having been increased.

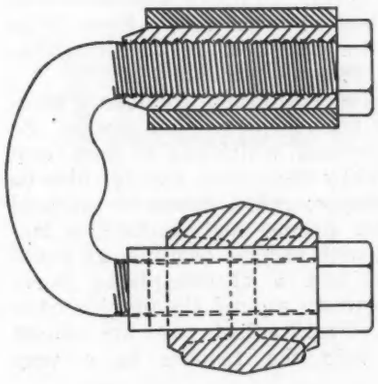
Frames

X members are in common use

With the complete elimination of the engine structure as a frame-bracing member, it has become necessary to further stiffen frames. X members are very generally used, and in most cases the forward legs of the X are carried all the way to the front cross member, combining with the side rails to form box sections at the sides of the engine, and with the front cross member to form a K member. The diagonals forming the X and K members come handy for supporting the powerplant at a minimum distance from the axis. As examples of the great increase in rigidity that can be obtained by such means, it may be pointed out that Packard doubled the torsional rigidity of its frames, and Auburn, which features what it calls an "X plus A" frame, trebled the rigidity with an increase in weight of only 11 per cent. With the object of achieving still greater rigidity of the frame-and-body assembly, Auburn has reenforced the cowl by means of tubular struts running diagonally.

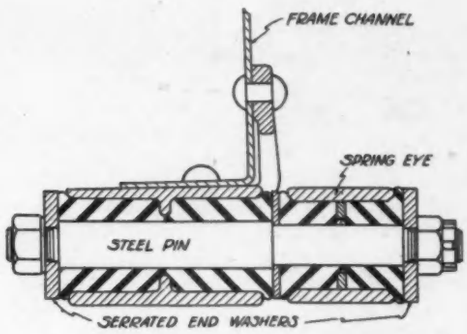
Other methods of stiffening frames consist in the use of box-section cross members, of which there are four in the new Pierce-Arrow frames, and pressing depressions in the web of the side rails, as in the Chevrolet frame at the rear kick-up. Finally, one channel may be placed inside another at points of maximum bending moment, and the side rail may be reinforced on the inside at points of spring attachment, steering-gear mounting, etc.

Graham continues the "banjo" frame, the use of which, in a further stiffened form, has been extended to all models, while in the Essex there is a reenforcing subframe opposite the engine.



Threaded type of silent U shackle as used on front axle of Continental Four

In at least two makes of car the lamp brackets and fender brackets on opposite sides of the car are rigidly tied together through the radiator, and, together with the radiator, are supported on a cushion located centrally on the front cross member of the frame. The top of the radiator being tied to the cowl by means of bracing rods, these various members of the front end of the car are held rigidly to the cowl and cannot vibrate perceptibly with relation to the body.

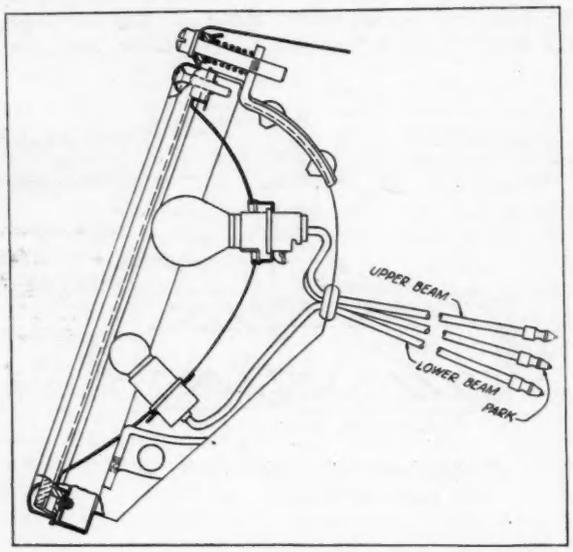


Rubber-insulated spring bolt as used on Graham car

Springs and Shock Absorbers

Inertia-control of shock-absorber action

Semi-elliptic springs continue to be used on practically all cars, but the new Continental Four and Light Six have a transverse spring in front and double quarter-elliptic cantilever springs at the rear. The rear springs are connected by spring bolts to lugs on the axle housing, one below and the other above the housing, as shown by the drawing reproduced herewith, and these springs take both the torque and the thrust. Continental, as well as a very considerable number of other makers, makes use of what is called a silent, threaded U shackle, of which a drawing is reproduced here. The two arms of the U are threaded and are surrounded by correspondingly threaded bronze bushings which are pressed into the spring eye and into a hole in the part to which it is shackled: The sliding motion resulting from spring action takes place at the threaded surfaces, which take care of both direct loads and thrust loads. Other types of spring shackles used besides the conventional one with plain cylindrical bearings are the Tryon with tapered, self-adjusting bearings, the Amplex with rubber bushings vulcanized to the metal surfaces, and the Fafnir ball-bearing shackle, of which Studebaker is the chief user. All of the Chrysler lines have oilite flexible inserts between spring leaves. Spring covers are more generally specified this year, all or practically all being of the metallic type. Hupp has introduced a side-way preventer, consisting of a 1-in. spring steel bar which extends across the chassis frame near the rear axle and is connected to the axle housing by arms and links in such a way that if the chassis spring on one side flexes more than that at the other, the bar is put under torsion. This naturally tends to restrain the rear end of the body



Inclined, spring-suspended two-bulb headlight of Willys car built into fender

to motion perpendicular to the axle, thus preventing side sway.

"Ride control," which was one of the chief novelties of a year ago, is continued by Packard (which introduced it), by Studebaker, by Nash, and possibly one or two others, but several makers who featured it last year have gone to what is known as inertia control of shock absorber action. Referring first to ride control, which consists of means for varying the intensity of shock-absorber action from the dash, several developments have taken place in this feature. Packard, for instance, now provides an additional, "soft" position in which the control is set for travel on smooth roads. Moreover, while in the earliest "ride-control" devices the control was effected by changing the area of the relief orifice positively, it is now accomplished by changing the pressure exerted by a spring on a valve controlling the size of the orifice, at least in some cases.

With the ordinary shock absorber the action is dependent entirely on the relative motion between the frame and the axle, which is slowed down and reduced by the shock absorber. The new inertia-controlled shock absorber differentiates between absolute motion in space of the frame and of the axle respectively. As long as the frame continues at about the same elevation there is very little shock absorber action, even if a wheel drops into a chuck hole and thereby increases the distance between frame and axle rapidly; but if the frame is thrown upward this action is at once checked by the shock absorber, the relief valve of which is closed by a spring-supported inertia weight which naturally tends to remain behind when the frame starts to move upward violently.

Lighting

Headlight control is being modified

Following the example set by Cadillac last year, a good many manufacturers this year provide a head light-control switch which instead of the usual two positions—bright and dim—has an additional position for country passing. In this position of the switch the beam from the lamp on the left is depressed to prevent annoyance to oncoming drivers, while the beam from the lamp on the right is in the normal position, so that the road will be illuminated for a considerable distance ahead. On the Packards this year the various requirements of road illumination are met by means of triple-filament lamps. On the new Willys cars the headlamps are built into the fenders and are spring-mounted for the protection of the filaments.

Generator capacity has been increased in a good many cases, because of the increased capacity of electrical consuming devices carried on cars. Headlight bulbs of higher candle power have been adopted and provision for radio installation are made on many cars. Battery capacities also are being increased, and a number of cars are being provided with a 15-plate battery which is put up in the same case as that used for the standard 13-plate battery. This battery has been available in the service field for about a year past.

Pontiac Enters 1933 With Single Line of Eights

(Continued from page 799)

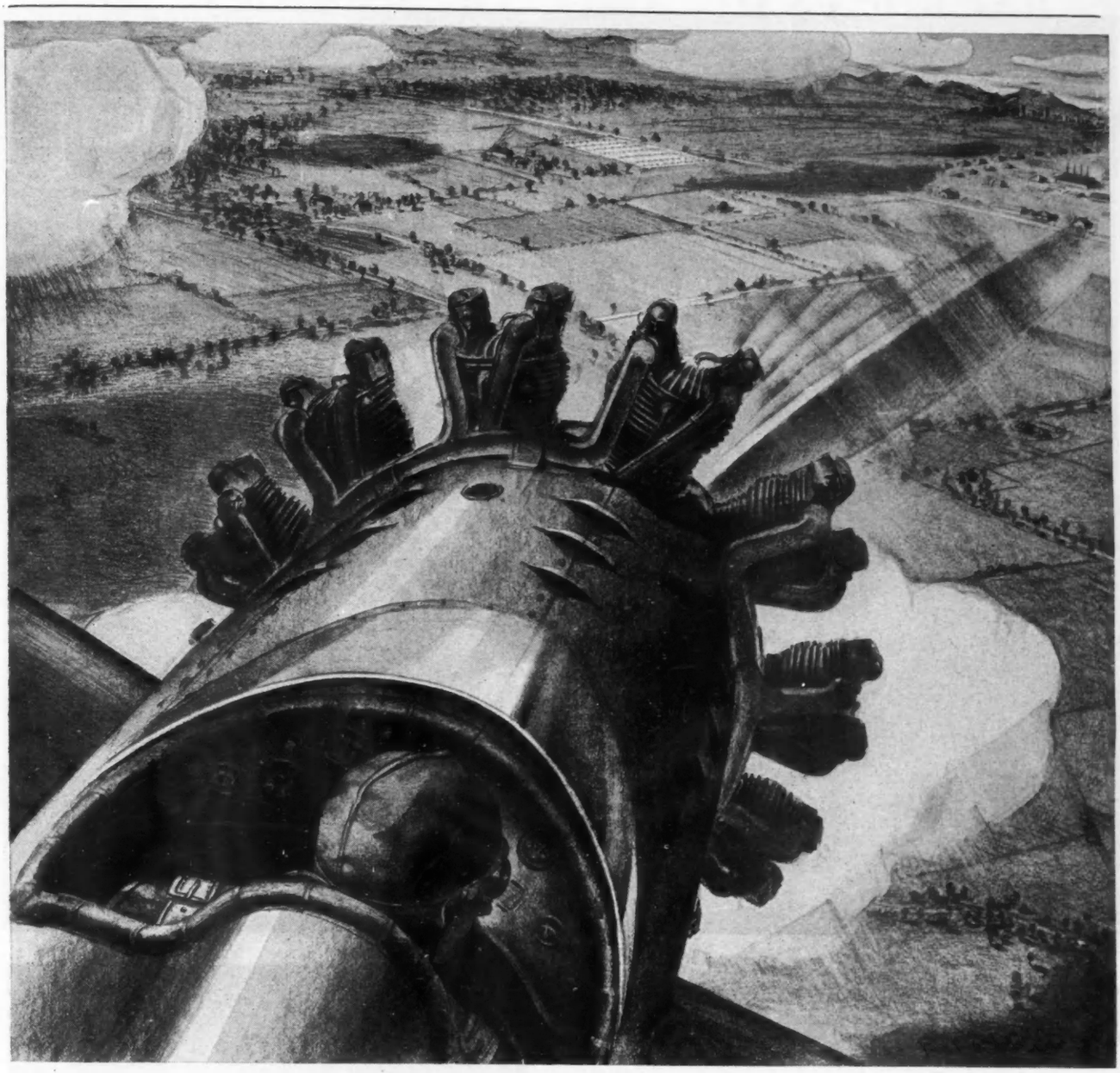
Thrust is taken by a block between the shafts and C-washers in the differential housing. Rear springs are insulated from the axle by rubber pads.

Brakes are of the Huck type used on other General Motors cars and have drums ribbed radially against distortion. Front axles are conventional. Front spring shackles are fitted with Inlox, rubber bushings, while rear shackles are of the threaded type. Spring bumpers are hollow, the air cushion providing a gradual take up (shock absorbing action). Steering gears are basically unchanged. One-way shock absorbers are standard.

The frame is entirely new and of the double drop type. It has six cross-members, and its side rails have ribs stamped in at the rear kick-up for strengthening. Other chassis details include a large (18-gallon) fuel tank, with fuel line outside of frame to protect against vapor lock; drop-center, 17-in. wire wheels with 5.50 section tires as standard, and Zerk chassis lubricating fittings.

Spring covers, tire covers, bumpers, spare tire and tire lock are furnished at extra cost. Five 16-in. wheels with 7.00 in. low-pressure tires are available as special equipment at extra cost.

Body equipment and details not previously mentioned include fender lamps which light up when the headlamp beam is depressed, which can be seen from the side of the car, and by the driver, and can also be separately lit for parking; reflex lenses in tail and stop lamps, adjustable license tag brackets, a lacquered radiator shell with chrome beading, an ornamental radiator cap, and a chrome-plated horn. Front fenders have gutters around the outside edge to catch road splash. Front splash pans are almost horizontal, blending into the fenders in a very graceful way.



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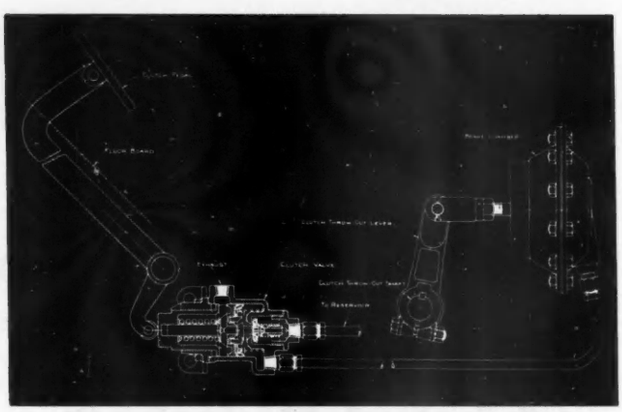

The new Bendix-Westinghouse Air Clutch Control is especially designed for neat, compact installation. As shown in the illustration above, the Air Clutch Control Valve may be operated directly through the conventional clutch pedal . . . the chamber, actuating the clutch throw-out shaft, becoming an integral part of the clutch housing. Complete technical details relative to the operation and advantages of Air Clutch Control are available in a recent Bendix-Westinghouse publication. Address your requests for this booklet direct to the Bendix-Westinghouse Automotive Air Brake Co.

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Automotive Products and Factory Equipment Manufactured by Advertisers in This Issue

See Alphabetical List of Advertisers on Page 39

This Advertiser's Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

Acid, Sulphuric
New Jersey Zinc Co.

Alloys
Ferro
New Jersey Zinc Co.
Non-Ferrous
New Jersey Zinc Co.

Arms & Knuckles, Steering
Atlas Drop Forge Co.

Axles
Atlas Drop Forge Co.
Park Drop Forge Co.

Bending & Straightening Machines
Chambersburg Engineering Co.
Chambersburg National Co.
Cleveland Punch & Shear Work Co.
National Machinery Co.

Blanks
Forged
Atlas Drop Forge Co.

Boring Machines
Baker Bros., Inc.
Foote-Burt Co.

Brake Boosters
Stewart-Warner Corp.

Brake Drums
Gunite Foundries Corp.
Motor Wheel Corp.

Brakes, Air
Bendix - Westinghouse Automotive Air Brake Co.

Brakes
Mechanical
Stewart-Warner Corp.

Bumpers
Stewart-Warner Corp.

Bushings
Fibre
Continental - Diamond Fire Co.

Cable
Brake or Cut-out Control
American Steel & Wire Co.
Ignition, Starting and Lighting
American Steel & Wire Co.

Camshafts
Atlas Drop Forge Co.
Gunite Foundries Corp.

Castings
Gray Iron
Gunite Foundries Corp.

Channels for Glass
Felt
American Felt Co.

Cleaners
Building Maintenance
Oakite Products, Inc.
Metal
American Chemical Paint Co. (Rust Preventive)
Ford Co., J. B.
Oakite Products, Inc.

Compounds, Cutting Grinding & Stamping
Oakite Products, Inc.

Compressors, Air
Bendix - Westinghouse Automotive Air Brake Co.
Curtis Pneumatic Machinery Co.

Connecting Rods
Atlas Drop Forge Co.

Cranes
Portable
Curtis Pneumatic Machinery Co.

Crankshafts
Atlas Drop Forge Co.
Park Drop Forge Co.

Cutters
Baker Bros., Inc. (Keyseating)
Fellows Gear Shaper Co. (Gear)

Disks, Clutch
Curtis Clutch Disc Co.

Drilling Machines
Baker Brothers, Inc.
Foote-Burt Co.

Enamels
American Chemical Paint Co. (Rust Proofing)

Felt
American Felt Co.

Fenders
Motors Metal Corp.

Fibre Rods, Sheets, Tubes
Continental - Diamond Fibre Co.

Forgings
Atlas Drop Forge Co.
Park Drop Forge Co.

Furnaces, Electric
(Annealing, Carburizing, Heat Treating, Forging and Welding
Electric Furnace Co.
Melting
Pittsburgh Lectromelt Furnace Corp.

Gaskets
Felt
American Felt Co.

Gear Cutting Machines
Fellows Gear Shaper Co. (Shapers)

Gear Material
Non-Metallic
Continental - Diamond Fibre Co.

Gears
Timing, Non-Metallic
Continental - Diamond Fire Co.

Grinding Machines
Fellows Gear Shaper Co.

Hammers
Power
Chambersburg Engineering Co.
Chambersburg National Co.
National Machinery Co.

Heat Treating
Barnes Co., Wallace Barnes - Gibson - Raymond, Inc.
Gibson, Wm. D., Co.

Heaters, Car
Stewart-Warner Corp.

Hoists, Portable
Curtis Pneumatic Machinery Co.

Hoods
Motors Metal Corp.

Hose, Flexible Metallic
(Radiator and Fuel Lines)
Titeflex Metal Hose Co.

Hubs
Gunite Foundries Corp. (Wheel)

Insulating Material
Continental - Diamond Fibre Co.

Keyseaters
Baker Brothers, Inc.

Lapping Machines
Fellows Gear Shaper Co.

Lathes
Automatic Chucking
Potter & Johnston Machine Co.
Turret
Potter & Johnston Machine Co.

Methods, Cleaning
Oakite Products, Inc.

Molded or Machined Parts (Phenolic)
Continental - Diamond Fibre Co.

Name Plates
Auld, D. L., Co.

Oil
Break-In
Acheson Oildag Co.
Lubricating
Acheson Oildag Co.

Pads
Felt
American Felt Co.

Paints
Heat Resisting
American Chemical Paint Co.

(Turn to page 38)

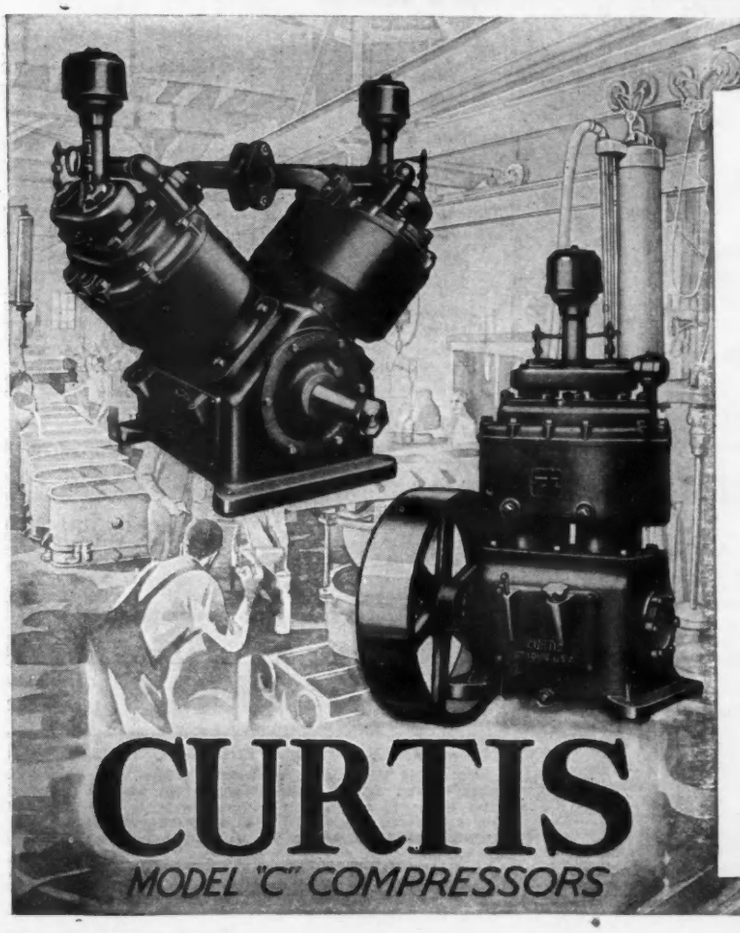
DROP Forgings

Crankshafts

Axles · Spindles
Gears · Cam Shafts
Pinions · Yokes · Hubs · Collars

Atlas Drop Forging range: 2 oz. to 500 lbs.

ATLAS
DROP FORGE CO. LANSING MICHIGAN



CURTIS
MODEL "C" COMPRESSORS

Curtis
Solves a big Problem of Compressor Operation

in perfecting practically carbon-free valves. New type head with short intake passages, oversize ports and straight line air flow—brings air into cylinder at lowest possible temperature, with resulting peak pressure and temperature of compression so low that there is practically no evaporation of oil on piston and cylinder walls.

Cooled air intake also greatly increases capacity of compressor.

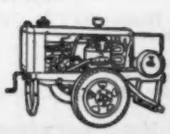
Carbon-Free Valves!

Timken Bearings! — Centro Ring Oiling!

Timken bearings assure longer life with easy adjustment. Centro-ring oiling provides controlled lubrication.

Entire design increases capacity in relation to size so that prices are relatively lower. Write for illustrated folder giving full details. Curtis Pneumatic Mchy. Co., 1917 Kienlen Ave., St. Louis, Mo.

2 and 4 Cylinder
Made in V-Belt and Direct Drive, Stationary and Portable Types



The OHIO SEAMLESS TUBE CO.
COLD DRAWN SEAMLESS STEEL TUBING
Shelby, OHIO

There is a Cleveland
Automatic for every purpose
THE CLEVELAND AUTOMATIC MACHINE CO.
CLEVELAND, O.
NEW YORK CHICAGO DETROIT

CRANKSHAFTS
and
Heavy Drop Forgings
THE PARK DROP FORGE CO.
CLEVELAND, OHIO

STAMPINGS
WORCESTER STAMPED METAL
Heavy, medium and light stampings in any quantity. A steady flow of production—*when* you want it.
WORCESTER STAMPED METAL CO.
Worcester, Mass.
· QUALITY STAMPINGS ·

QUALITY STAMPINGS
FENDERS
DUST SHIELDS
RUNNING BOARD SHIELDS
RUNNING BOARDS
HOODS
RADIATOR SHIELDS
BODY STAMPINGS
MOTORS METAL MFG. CO.
5936 Milford Ave. Detroit, Mich.

FELT
AMERICAN FELT CO.
NEW YORK DETROIT CHICAGO

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Pickling Compounds
American Chemical Paint Co.

Plates, Clutch Pressure
Gunite Foundries Corp.

Plating Equipment and Supplies
Oakite Products, Inc.

Plugs
Expansion
Hubbard Spring Co., M. D.

Presses
Chambersburg Engineering Co.
Chambersburg National Co.
Cleveland Punch & Shear Works Co.
National Machinery Co.

Punches
Cleveland Punch & Shear Works Co.

Radiator Shells
Motors Metal Corp.

Radiators
Young Radiator Co.

Removers, Enamel and Paint
American Chemical Paint Co.
Oakite Products, Inc.

Running Boards
Metal
Motors Metal Corp.

Rust Removers & Preventives
American Chemical Paint Co.
Oakite Products, Inc.

Screw Machine Products
Barnes Co., Wallace

Screw Machines
Cleveland Automatic Machine Co.
Potter & Johnston Machine Co.

Shears
Cleveland Punch & Shear Works Co.

Sheet Metal Machines
Cleveland Punch & Shear Works Co.

Shock Absorbers
Stewart-Warner Corp.

Special Machinery
Baker Brothers, Inc.
Cleveland Automatic Machine Co.

Speedometers and Tachometers
Stewart-Warner Corp.

Springs
Extension, Compression, Torsion or Flat
American Spring & Mfg. Corp.
American Steel & Wire Co.
Barnes Co., Wallace
Barnes-Gibson-Raymond, Inc.
Cook Spring Div.
Gibson, Wm. D., Co.
Hubbard Spring Co., M. D.
Mather Spring Co.
Raymond Mfg. Co.

Leaf
Mather Spring Co.

Valve
American Steel & Wire Co.

Stampings or Drawings, Metal
Auld, D. L., Co.
Barnes Co., Wallace
Barnes-Gibson-Raymond, Inc.
Cook Spring Div.
Gibson, Wm. D., Co.
Hubbard Spring Co., M. D.
Motor Wheel Corp.
Motors Metal Corp.
Raymond Mfg. Co.
Worcester Stamped Metal Co.

Steam Cooling
Rushmore Laboratory

Steel

Alloy
Illinois Steel Co.
Republic Steel Corp.

Bars
Illinois Steel Co.
Republic Steel Corp.

Billets
Illinois Steel Co.

Carbon
Illinois Steel Co.
Republic Steel Corp.

Cold Drawn
American Steel & Wire Co.
Republic Steel Corp.

Electric Furnace
Illinois Steel Co.

Shapes
Illinois Steel Co.

Spring
Barnes Co., Wallace
Barnes-Gibson-Raymond, Inc.
Gibson, Wm. D., Co.

Stainless
Illinois Steel Co.
Republic Steel Corp.

Strip
American Steel & Wire Co.
Illinois Steel Co.
Republic Steel Corp.

Tapping Machines
Baker Bros., Inc.
Foote-Burt Co.

Threaded Generators
Fellows Gear Shaper Co.

Trolleys, Electric
Curtis Pneumatic Machinery Co.

Tubes, Axle, Steering Column & Torque
Ohio Seamless Tube Co.

Tubing
Flexible Metal
Titeflex Metal Hose Co.
Seamless
Ohio Seamless Tube Co.
Steel
Ohio Seamless Tube Co.

Tubular Products
Ohio Seamless Tube Co.

Turret Machines, Automatic
Potter & Johnston Machine Co.

Vacuum Tanks
Stewart-Warner Corp.

Ventilators
Weathershields, Ltd.

Visors, Windshield
Weathershields, Ltd.

Washers
Felt
American Felt Co.
Plain Metal
Hubbard Spring Co., M. D.

Welding Material
American Steel & Wire Co. (wires and electrodes)

Wheels
Motor Wheel Corp.

Wicks, Felt
American Felt Co.

Windshield Wipers
Stewart-Warner Corp.

Wire
Flat, Round, Square or Special Shape
Barnes Co., Wallace
Spring
American Steel & Wire Co.
Barnes Co., Wallace
Republic Steel Corp.

Wrenches
Gunite Foundries Corp.

Zinc, Sheets, Slabs, Sticks, Strip, etc.
New Jersey Zinc Co.

CLASSIFIED

HAVE YOU ANYTHING TO SELL?
We are in the market for surplus stocks or over-runs of manufactured articles. Also interested in manufacturing or sales rights of meritorious automobile accessories or parts. Our sales force consists of 15 men covering the entire country and representatives in the principal countries throughout the world.
CHICAGO ACCESSORIES BROKERAGE CO.
1460 So. Michigan Ave., Chicago, Ill.

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The Advertisers' Index is published as a convenience, and not as a part of the Advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

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Weathershields Ltd Patented **SLIDING ROOF**

Specially Designed for Mass Production Jobs

Its Outstanding Features Are:

1. Absolutely weatherproof and rattle-proof
2. Creates no draught in winter and gives ideal ventilation in summer
3. Enables passengers to view scenery, buildings, etc., and have the benefit of the sunlight
4. Easily operated by central handle while driving and locks in any position
5. Can be used as a stand at aviation meetings and as an exit in case of accidents.

We are prepared to grant licenses to reputable firms to incorporate this feature in their bodies.

Export Agent and Sales Engineer

HUGH GREEN, M. I. Auto. E., A.M.I.M.E.
2, Queen's Road, Coventry, ENGLAND

WEATHERSHIELDS LTD., MOOR STREET BIRMINGHAM, ENGLAND

SCIENTIFIC MATHER SPRINGS

A point by point comparison quickly reveals the advantages of Mather Springs.

THE MATHER SPRING CO., TOLEDO, OHIO

Manufacturers of Scientifically Heat Treated Automobile Springs

Young Radiators

Quality automotive radiators for trucks, buses, passenger cars and industrial service; condensers, evaporators, unit heaters, convectors, blast coils and special cooling and heating units of all kinds.

YOUNG RADIATOR COMPANY
Racine 707 Mead St. Wisconsin

Pacific Coast Representative
W. H. BENDUHN
664 Mission St.
San Francisco

Young Quality
Reg. U. S. Pat. Off. © Y. R. Co.

YOUNG RADIATORS ARE USED WHERE THE GOING IS TOUGH

CLEAN floors are SAFE floors!
Floors covered with grease and oil drippings are unsightly and unsafe. They are a fire hazard. They may cause accidents. Guard against these risks by cleaning plant floors regularly the safe, low-cost Oakite way. Speedily removes oil and grease deposits, leaving wood, concrete or other flooring clean and dry. Write for details on economical methods for doing all plant maintenance work.
Manufactured only by
OAKITE PRODUCTS, INC., 28 Thames St., NEW YORK
OAKITE
Industrial Cleaning Materials and Methods

EXPANSION PLUGS

FOR CLOSING CORE HOLES

COILED and FLAT SPRINGS
PHOSPHOR BRONZE SPRINGS A SPECIALTY
SMALL STAMPINGS
WASHERS and SPRING COTTERS
WIRE SHAPES

M. D. HUBBARD SPRING CO.
620 SOUTH BLVD. PONTIAC, MICHIGAN

PJ FOR OVER A QUARTER OF A CENTURY PJ
THE PIONEER MANUFACTURER OF AUTOMATIC CHUCKING EQUIPMENT
POTTER & JOHNSTON MACH. CO.
PAWTUCKET, R. I., U. S. A.

IT'S IMPOSSIBLE TO OVERHEAT THE ENGINE WITH
Steam Cooling
Rushmore Laboratory
PLAINFIELD • NEW JERSEY

DIAMOND Vulcanized Fibre
Sheets, rods, tubes, washers and special shapes, to meet every insulating need
Also CELORON Timing Gears and DILECTO.
CONTINENTAL-DIAMOND FIBRE CO.
Newark, Delaware

CLEVELAND POWER PRESSES
FOR PROFITABLE PRODUCTION
THE CLEVELAND PUNCH & SHEAR WORKS COMPANY
CLEVELAND, OHIO

AMERICAN SPRING AND MFG. CORP.
SPRINGS—COIL and FLAT
WIRE FORMS
HOLLY, MICHIGAN

DEOXIDINE— Prepares Auto Bodies for Painting
RODINE— Pickle Bath Control
STRIPPLE High Speed Enamel Remover
PEROLINE— Rust Preventing Oil
KEMICK— Manifold Paint
FLOSOL— Soldering Flux
PARADOX— Rust Proofing Enamel
AMERICAN CHEMICAL PAINT CO.
AMBLER, PENNA.

NAME PLATES — ALL KINDS
Vitreous enameled, embossed, bronze, chrome plated, brass, etc.
Tell us the purpose and we will design a plate for your approval.
THE D. L. AULD CO.
COLUMBUS, OHIO

CASTINGS
EST. IN 1854
GUNITE . . . . . Z-RON
MALLEABLE . GRAY IRON
GUNITE FOUNDRIES CORP., ROCKFORD, ILLINOIS

Engineering Library

News of the Industry Begins Page 805

vail for #27

JAN 3 1933

AUTOMOTIVE INDUSTRIES

LAND AIR WATER

Volume 67
Number 26

PUBLISHED WEEKLY AT CHESTNUT AND 56TH STREETS
PHILADELPHIA, DECEMBER 24, 1932

$1.00 a year
25c a copy

STEWART-WARNER
Automatic
"FULL POWER"
POWER BRAKES
will do more to boost car sales this year than any other feature!

PIERCE-ARROW
... the *FIRST* U. S. motor car to adopt complete Power Brake equipment chose Stewart-Warner

Entered as second-class matter Oct. 1, 1925, at the post office at Philadelphia, Pa., under the Act of March 3, 1879

A close-up showing the new Fellows Gear Measuring Machine set for measuring the involute profile of a helical gear tooth. Quick change-over sets measuring units to inspect tooth profile in combination with lead and other essential elements of spur and helical gears.

"A NOTEWORTHY CONTRIBUTION TO BETTER GEAR MAKING"

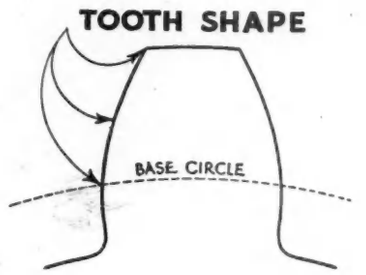
Was the expression used by a prominent shop executive in referring to the new Fellows Gear Measuring Machine.

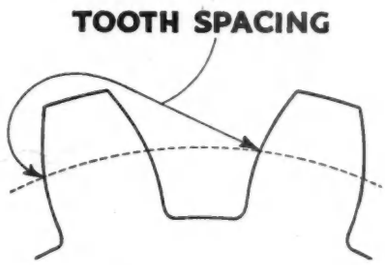
This machine provides the means for accurately checking, not one, but all of the essential elements of gear teeth, and in a manner that can be easily accomplished and understood by the average mechanic.

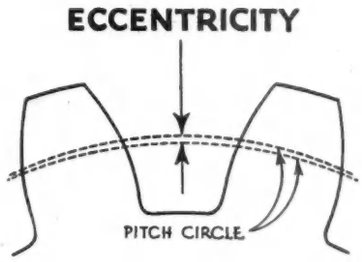
It places in the hands of the manufacturing department facilities for producing still better gears at lower costs, and represents a further measure of control inherent in the Fellows Gear Shaper Method.

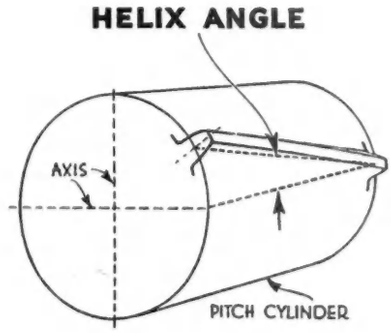
If you are interested in what this new machine will do for you, write for a copy of the circular describing its principal features.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont, U. S. A.
616 Fisher Building, Detroit, Michigan





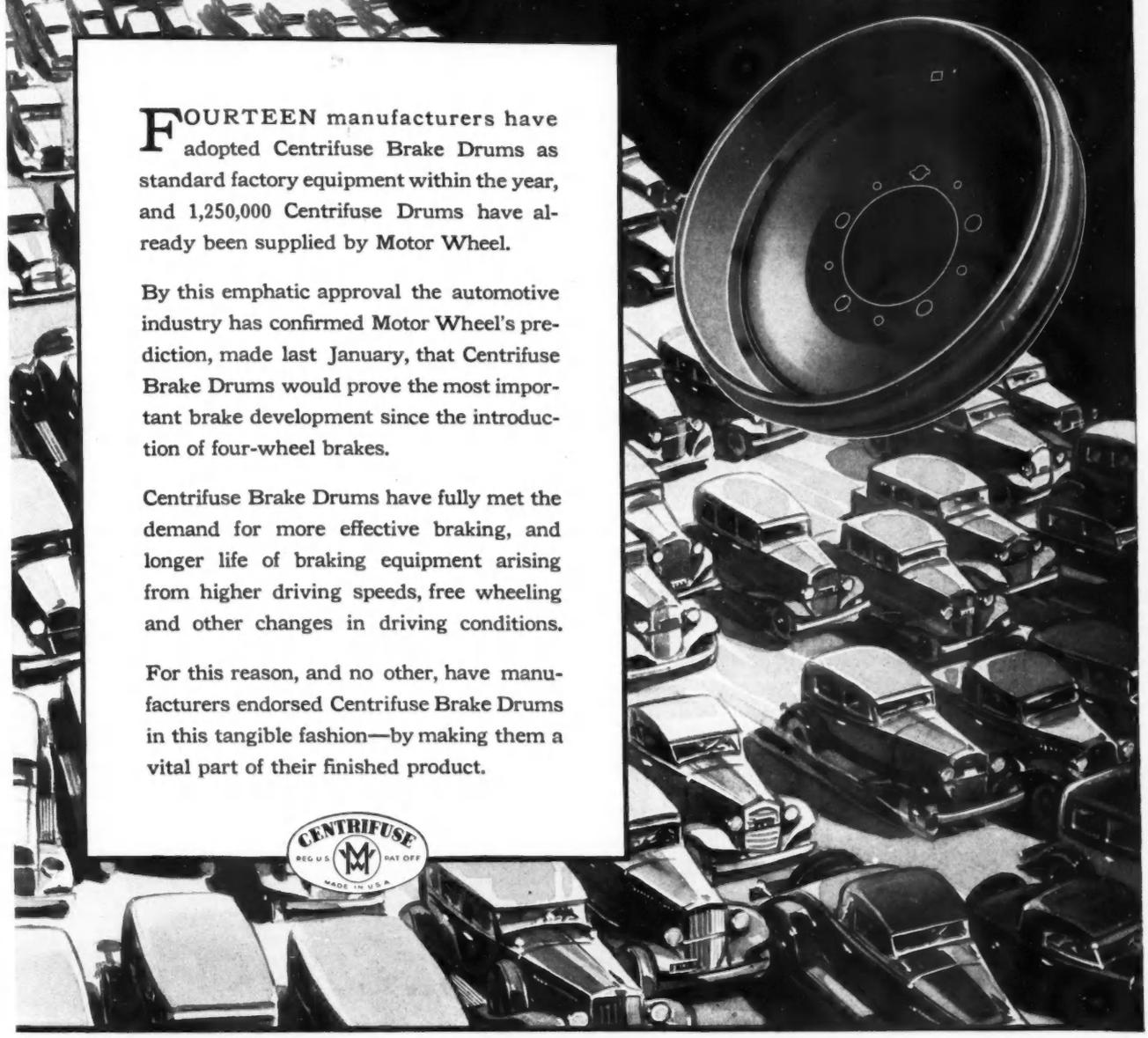




FELLOWS
~ GEAR SHAPERS ~

THEY AGREE THAT WE WERE RIGHT

about CENTRIFUSE Brake Drums



FOURTEEN manufacturers have adopted Centrifuse Brake Drums as standard factory equipment within the year, and 1,250,000 Centrifuse Drums have already been supplied by Motor Wheel.

By this emphatic approval the automotive industry has confirmed Motor Wheel's prediction, made last January, that Centrifuse Brake Drums would prove the most important brake development since the introduction of four-wheel brakes.

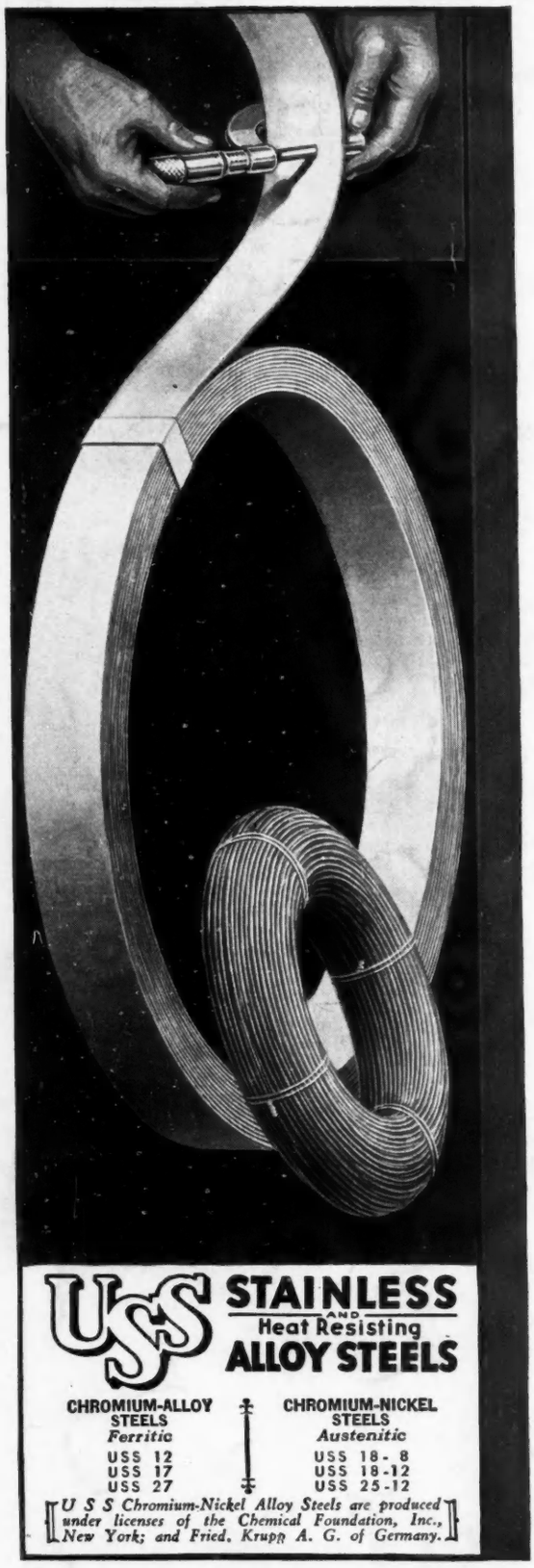
Centrifuse Brake Drums have fully met the demand for more effective braking, and longer life of braking equipment arising from higher driving speeds, free wheeling and other changes in driving conditions.

For this reason, and no other, have manufacturers endorsed Centrifuse Brake Drums in this tangible fashion—by making them a vital part of their finished product.

CENTRIFUSE REG. U.S. PAT. OFF. MADE IN U.S.A.

MOTOR WHEEL CORPORATION, *Lansing, Michigan*

Manufacturers of **Demountable Wood, Steel and Wire Wheels . . . Forged Spoksteel Truck, Bus and Trailer Wheels . . . Industrial Stampings . . .** ***Sole Producers of*** **Centrifuse Brake Drums**



USS STAINLESS and Heat Resisting ALLOY STEELS

CHROMIUM-ALLOY STEELS *Ferritic*	CHROMIUM-NICKEL STEELS *Austenitic*
USS 12	USS 18-8
USS 17	USS 18-12
USS 27	USS 25-12

U S S Chromium-Nickel Alloy Steels are produced under licenses of the Chemical Foundation, Inc., New York; and Fried. Krupp A. G. of Germany.

USS STAINLESS and Heat Resisting ALLOY STEELS

COLD ROLLED STRIP STEEL WIRE AND WIRE PRODUCTS

Constant Uniformity

The strictest of laboratory and shop supervision governs every mill and manufacturing operation in our production and insures constant adherence to specifications. This policy is of special importance in the production of cold rolled strip steel—wire and wire products in stainless and heat-resisting alloy steels.

Regardless of what your fabricating problem may be—whether you need cold rolled strip steel in coils or strips up to 24 inches wide—whether your merchandise calls for cold drawn wire in coils or straightened and cut lengths, you will find an exact and economical solution to your problem here.

Our engineers will gladly assist you in determining which of the six U S S compositions is best suited to your needs. Upon request we will mail you an interesting and comprehensive booklet on U S S Chromium and Chromium-Nickel Alloy Steels.

AMERICAN STEEL & WIRE COMPANY

208 S. La Salle St., Chicago — SUBSIDIARY OF UNITED STATES STEEL CORPORATION — Empire State Bldg., New York

AND ALL PRINCIPAL CITIES

Pacific Coast Distributors: COLUMBIA STEEL CO., *San Francisco* *Export Distributors:* U. S. STEEL PRODUCTS CO., *New York*

The Manufacturing Companies of the United States Steel Corporation listed below also produce U S S Stainless and Heat Resisting Alloy Steels

AMERICAN SHEET AND TIN PLATE COMPANY — *Sheets and Light Plates*

NATIONAL TUBE COMPANY — *Pipe and Tubular Products*

CARNEGIE STEEL COMPANY, AND ILLINOIS STEEL COMPANY — *Bars, Plates, Shapes, Special Sections and Semi-Finished Products*